

Core HR Business Case Analysis Update Table of Contents

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EXECUTIVE SUMMARY

I. Introduction and Background

Of the major challenges facing NASA today, perhaps none are more difficult than the challenge of managing a world-class research and development Agency for aeronautics, space science and technology in an environment of diminishing resources. To meet this challenge head on, NASA has embarked on several initiatives aimed at aligning its programs with its unfolding budget realities. Foremost in these efforts have been the development of NASA's strategic plan and strategic planning process.

As a result of those efforts, NASA recognizes, and is responsive to, the reality of its current operating environment. To fully realize its potential as the preeminent research and engineering Agency, NASA must do more than continue delivering cutting edge scientific breakthroughs. To keep the trust of the American taxpayers, NASA must address the long-standing need to implement a fully integrated financial management system. To that end, NASA's objective is to acquire an Integrated Financial Management system that supports the NASA mission and meets the requirements of the Joint Financial Management Improvement Program (JFMIP) Federal Financial Management System. JFMIP Federal Financial Management System is a joint cooperative of the Office of Management and Budget (OMB), General Accounting Office (GAO), the Department of the Treasury, and the Office of Personnel Management (OPM).

This Business Case Analysis (BCA) serves as a decision tool for replacing NASA's Core Human Resources (HR) systems as part of the Integrated Financial Management Program (IFMP) effort. The selected alternative to replace the Core HR legacy systems and processes will be chosen based on cost effectiveness, risk, and most importantly, the direct impact on satisfying NASA's business drivers.

Exhibit 1: Business Drivers

Business Driver	What it Means
1 Provide timely, consistent and reliable information for management decisions	Implement standard systems and processes to promote data consistency, and provide analysis and reporting tools to get the right information to the right people at the right level so that they can make timely, informed decisions.
2 Improve NASA's accountability and enable full cost management	Implementing full cost accounting will result in increased accountability by providing the means to determine total program costs and relate costs to value.
3 Achieve efficiencies and operate effectively	NASA must evaluate and improve the efficiency and effectiveness of business processes to appropriately support mission program requirements.
4 Exchange information with customers and stakeholders	Provide the infrastructure and tools that will make data accessible to a wider range of internal and external customers.
5 Attract and retain a world class workforce	NASA needs to continue to attract and retain highly qualified individuals to support the goals and objectives of the strategic enterprises and the infrastructure of the Agency.

II. Case For Change

NASA, like all Federal Agencies, is being buffeted by important demographic changes. Specifically, the Federal workforce is aging; the baby boomers, with their valuable skills acquired through years of service, are nearing retirement; new employees joining the civil ranks today have different employment opportunities and different career expectations than the generation that preceded them. In response to an increasingly competitive job market, NASA will need the tools and flexibility to attract, hire, and retain the highest caliber talent. More and more, NASA requires a knowledge-based workforce that is sophisticated in new technologies, flexible, and open to continuous learning. NASA's workforce of the future must be both adept at delivering services directly and at effectively managing the cost and quality of services delivered by third parties on NASA's behalf. Furthermore, NASA's employment structures and working arrangements will continue to evolve, and the workplace will need to accommodate a greater mix of full-time, part-time, and temporary workers; diminishing job security; and the possibility of government downsizing and realignments. These factors will undoubtedly strain NASA's existing HR capabilities.

Significant shortcomings exist with the current environment. These include:

- The current systems do not support management decision processes
- Most HR functions are not supported by automated systems
- The majority of the HR processes are labor and paper intensive
- The current systems are not user friendly
- The current systems perpetuate non-standardized processes and reporting capabilities (vary by Center).

To address these shortcomings and meet the Agency's internal and external challenges, NASA has increased its commitment to the strategic management of human capital. Motivated by the proposition that its workforce is its greatest strength, NASA began the process of developing a roadmap for achieving preeminence in Human Resources management. Specifically, NASA needs to achieve greater cost effectiveness of its mission support functions in order to maintain its status as a world-class research and technology Agency. Additionally, NASA desires to integrate Agency-wide business systems that enable better decision-making, and enable HR professionals to take on more consultative roles. Furthermore, NASA stakeholder servicing can be enhanced by a Core HR system that utilizes modern user-interface capabilities and a centrally maintained, remotely accessible database. In short, NASA needs to upgrade, or replace, its existing HR system capabilities in order to direct its diminishing budgetary resources to its primary science missions, increase stakeholder satisfaction and maintain legal compliance.

III. Alternative Overview

NASA commissioned several analyses to determine which products would best address NASA IFM Program needs. At the conclusion of these BCAs in the summer of 2000, NASA moved forward with the formulation and planning of the Core Finance Module. An open requisition for

the solution was placed in the marketplace and Systems, Applications & Products in Data Processing (SAP) emerged as the vendor of choice.

SAP's system offers complete Enterprise Resource Planning (ERP) functionality. Licenses for this system are not specific to any functional area, but rather enable access to all functionality within the system. Thus, when NASA purchased SAP licenses for the Core Finance Module, the Agency bought all of SAP's functionality. Further investigation revealed that SAP could satisfy many of NASA's requirements, including NASA's Core HR requirements. Due to this functional fit and SAP's licensing and architectural scheme, NASA decided to pursue a "Best-of-Suite" approach, specifically SAP, for an integrated solution.

After evaluating a full range of alternatives for meeting current system shortcomings, the Status Quo and one viable alternative were identified as meriting a detailed analysis.

Exhibit 2 presents the viable alternatives. The BCA framework was used to analyze these alternatives based on costs, benefits, risks, and driver satisfaction.

Exhibit 2: Core HR Viable Alternatives

Alt #	Alternative Title	Alternative Description
SQ	Status Quo	<p>This alternative is defined as "the do nothing approach" with the exception of performing mandatory upgrades of the current functional management systems to meet Federal, State and NASA requirements. This alternative includes maintaining the processes and information technologies that currently comprise the HR systems. These systems include:</p> <ul style="list-style-type: none"> - NASA Personnel/Payroll System (NPPS) - Consolidated Agency Personnel and Payroll System (CAPPS) - NASA Training and Development System (NTDS) - AdminSTAR - Employee Express (EE) - Center-uniques
1	SAP	<p>This alternative is defined as acquiring and implementing the SAP R/3 software package to replace the current HR legacy systems. These systems include:</p> <ul style="list-style-type: none"> - NPPS - CAPPS - NTDS - AdminSTAR - EE - Center-uniques

IV. Alternative Analysis

For each alternative, a complete cost analysis was conducted. In addition to developing life cycle cost estimates, the quantitative benefits, which include systems savings and cost avoidances, were also considered. The impact of an alternative on NASA business driver satisfaction was considered as a "qualitative" benefit for this analysis. Each of the alternatives was also evaluated against four risk categories: integration complexity risk, market risk, technical risk, and implementation risk.

IV.I Costs

The cost element structure used for this analysis includes two categories: Investment and Operations and Sustaining Support. Investment costs includes costs to: select the software vendor, select the implementation contractor, design the new system, and conduct the Pilot, and also the costs to implement the selected alternative at the remaining nine NASA Centers. System Operations and Sustaining Support costs include the costs and recurring fees to maintain the selected alternative. Exhibit 3 presents the total ten-year present value costs for each of the alternatives.

Exhibit 3: Cost Summary Table – 10-Year Present Value Costs (\$000s)

	WBS Element	Status Quo	SAP
Investment Cost			
<i>Program Management (Program Cost)</i>	1.1	\$ -	\$ -
<i>Integration Project (Program Cost)</i>	1.2.1+1.2.2	\$ -	\$ 1,275
<i>Core HR Module Project (Program Cost)</i>	1.3	\$ -	\$ 18,189
<i>Core HR Module Project (Enterprise Cost)</i>	2.1.1...2.1.4	\$ -	\$ 20,995
Total Investment Costs		\$ -	\$ 40,458
Operations and Sustaining Support			
<i>Integration Project (Program Cost)</i>	1.2.3	\$ -	\$ 5,307
<i>Core HR Module Project (Enterprise Cost)</i>	2.1.5	\$ 28,014	\$ 15,362
Total O&S Costs		\$ 28,014	\$ 20,669
Total Present Value Cost		\$ 28,014	\$ 61,127

As presented in the above exhibit, the SAP alternative poses a greater overall total present value cost. However, the operations and sustaining support cost for the SAP alternative is approximately 75% of the operations and sustaining support cost of the Status Quo alternative.

IV.II Benefits

Two types of quantitative benefits were examined for this analysis. First, savings resulting from lower operations and sustaining support costs for the SAP alternative over the Status Quo were quantified. The SAP alternative yielded a positive system savings. In addition to these system savings, this analysis also identified a cost avoidance of not having to hire an additional 78 FTEs.¹ This additional staff is necessary to respond to the overburdened Core HR staff that is currently unable to perform its primary duty of being a strategic partner due to the lack of resources for transactional work. Exhibit 4 presents the total 10-year present value of the total quantitative benefits.

¹ Due to the 36% reduction in HR civil service staff since 1993, the HR community is overburdened with transactional type work and has inadequate resources to act as a strategic partner, change agent, and employee champion. The Human Resources Transactional Services Contracting study concluded 78 FTEs would be needed Agency-wide in order to relieve the HR community's transactional work burden and allow them to shift to their primary mission of being a strategic partner.

Exhibit 4: Total Quantitative Benefits in Present Value (\$000s)

		FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
a	System Savings	\$ -	\$ (330)	\$ (1,304)	\$ 298	\$ 1,611	\$ 1,561	\$ 1,443	\$ 1,398	\$ 1,355	\$ 1,313	\$ 7,345
	Contractor Cost Avoidance	\$ 4,360	\$ 4,225	\$ 4,094	\$ 3,967	\$ 3,844	\$ 3,725	\$ 3,610	\$ 3,498	\$ 3,389	\$ 3,284	\$ 37,997
	Total Benefits	\$ 4,360	\$ 3,896	\$ 2,790	\$ 4,266	\$ 5,455	\$ 5,286	\$ 5,052	\$ 4,896	\$ 4,744	\$ 4,597	\$ 45,342

In addition to quantitative benefits, qualitative benefits were also considered. Each viable alternative was scored against its potential ability to satisfy NASA's functional and business drivers. Each alternative's numerical score was then converted to a red, yellow or green rating based on the following scale:

Score	Benefit	Color
1.0 – 1.6	Low Benefit	Red
1.7 – 2.3	Average Benefit	Yellow
2.4 – 3.0	High Benefit	Green

The result of the benefit analysis is included in Exhibit 5.

Exhibit 5: Benefit Score Summary

BD	Functional Driver	Weight	Status Quo	SAP
1	Strategic workforce planning and allocation ability based on competencies		1	3
	Link employee competencies, future needs and employee development to ensure strategic requirements		1	3
	Average of BD #1	30%	1.0	3.0
2	Workforce allocation to highest priority programs and		1	3
	Time and Attendance and Labor Distribution to tie the employee cost to program and projects		1	3
	Improve management of training, awards and salaries		1	3
	Average of BD #2	20%	1.0	3.0
3	Improve efficiency in operation		1	3
	Ability to move from transaction-based orientation to consultative services		1	3
	Average of BD #3	20%	1.0	3.0
4	Share personnel, hiring, and competency information across Centers		1	3
	Employee self-service capabilities		2	3
	Management self-service capabilities		1	3
	Average of BD #4	15%	1.3	3.0
5	Improve planning and development based on competencies		2	3
	Accelerate personnel action		1	3
	Average of BD #5	15%	1.5	3.0
	Weighted Average Ranking	100%	1.1	3.0
			Red	Green

The SAP alternative provides “high benefits,” meaning it would significantly impact (positively) NASA's ability to meet the business drivers.

IV.III Risk

There are various ways to categorize risks that affect information technology (IT) investment projects, but for the purposes of this process, the following risk categories were selected: integration complexity risk, market risk, technical risk, and implementation risk. Each of the

alternatives was scored against each of these risk categories. Each alternative's numerical score was also converted to a red, yellow or green rating based on the following scale:

Score	Risk	Color
1.0 – 1.6	Low Risk	Green
1.7 – 2.3	Average Risk	Yellow
2.4 – 3.0	High Risk	Red

Exhibit 6 presents the risk analysis scores for each alternative.

Exhibit 6: Risk Score Summary

Risk Category	Weight	Status Quo	SAP
Integration Complexity	40%	1.3	1.0
Market Risk	15%	2.0	1.3
Technical Risk	10%	2.0	1.2
Implementation/Project Risk	35%	1.0	2.1
Weighted Average	100%	1.37	1.45
	Rating	Green	Green

The Status Quo and SAP alternative received close overall scores, however, the risk of each alternative varied by category. The Status Quo alternative has a low integration complexity risk score because it has few interfaces to other systems, which also means that it has few of the benefits associated with more integrated systems. The market and technical risk for the Status Quo are average due to the antiquated systems that make up the legacy environment. The implementation risk for the Status Quo is not applicable and received the lowest risk rating. The SAP alternative received low risk scores in the integration complexity, market, and technical risk categories. The market and technical risk categories were driven slightly higher due to risk surrounding SAP's schedule for federalizing their Core HR functionality. SAP's Implementation/Project risk received an average risk rating due to the extent of change management required and the complexity of implementing such a robust system.

V. Recommendation

Selecting the appropriate alternative to replace the existing Core HR systems is based on an evaluation of the cost, benefit, and risk findings. Exhibit 7 summarizes the composite results of this analysis.

Exhibit 7: Decision Analysis Summary (000's)

	Status Quo		SAP
<i>PV Cost - Investment</i>	\$	-	\$ 40,458
<i>PV Cost - O & M</i>	\$	28,014	\$ 20,669
Total PV Costs	\$	28,014	\$ 61,127
<i>PV Benefits - System Savings</i>	\$	-	\$ 7,345
<i>PV Benefits - Cost Avoidance</i>	\$	-	\$ 37,997
Total PV Benefits	\$	-	\$ 45,342
Qualitative Benefits	Red		Green
Risk	Green		Green

The purpose of this BCA is to serve as a decision tool for replacing NASA's Core HR systems as part of the IFMP effort. This analysis identified the cost, benefits, and risks associated with the viable alternatives. Weighing those discoveries against the IFM business drivers and the associated Core HR functional drivers, the SAP alternative provided the highest benefit levels, along with relatively low levels of risk, and is the recommended alternative for the Core HR module.

1 INTRODUCTION

This Business Case Analysis (BCA) outlines the case for change for the Core HR module. This module includes personnel, benefit administration, training and labor relations functions. A Core HR module will provide training and development opportunities for employees; manage employee performance, recognition, and benefits programs; resolve disputes and complaints; and administer labor relations. New system capabilities will improve information handling and enable better program planning and administration. Information on the skills and competencies of individual employees will be gathered and updated and will be used in the “Manage Organizational Effectiveness” sub-process to make workforce planning and sizing decisions. The separation of employees, the final aspect of the employee life cycle, will be improved as employees and supervisors initiate separation actions on-line and the system will generate customized benefits information packages and separation/retirement forms with information already in the HR-Payroll database. The system will provide employees with access to annuity computations and related information.

This BCA will investigate alternatives to replace NASA’s legacy Core HR systems. These alternatives will be evaluated on costs, benefits, and risks. The detailed assumptions, analysis, and results are presented in this document.

1.1 Background

Responding to legislative and executive requirements (e.g., The Chief Financial Officers Act of 1990; Federal Financial Management Act of 1996), NASA’s Chief Financial Officer established the Integrated Financial Management Program (IFMP) in 1995. IFMP is an ongoing effort to develop a single, integrated, enterprise-wide management system aimed at alleviating many of NASA’s business and administrative challenges.

The need for IFMP has been clarified by congressional oversight and General Accounting Office audits, along with NASA’s own internal review and planning processes. Through these processes, NASA has determined that its existing financial and management systems do not fully meet current Federal financial management requirements, and do not provide NASA managers with the information necessary to guide NASA to the successful achievement of its strategic goals. NASA’s current financial management systems also reflect NASA’s highly decentralized organizational structure. In addition to Headquarters, there are nine Centers:

- Ames Research Center (ARC)
- Dryden Flight Research Center (DFRC)
- Goddard Space Flight Center (GSFC)
- Johnson Space Center (JSC)
- Kennedy Space Center (KSC)
- Langley Research Center (LaRC)
- Glenn Research Center (GRC)
- Marshall Space Flight Center (MSFC)
- Stennis Space Center (SSC)

Some Centers have affiliated locations (e.g., GSFC is responsible for the operation of the Wallops Flight Facility); and NASA has a federally funded research and development Center, the Jet Propulsion Laboratory (JPL), which is operated by the California Institute of Technology.

Each Center's financial management system has evolved to support Center-unique missions and capabilities. Although these systems have served their purposes, they are no longer adequate given today's budgetary and regulatory environments.

To support the management of NASA's financial, human, and physical resources, IFMP encompasses additional functional areas important for NASA's strategic success. In exploring options for a replacement to the NASA legacy systems, NASA commissioned separate BCAs for each of the following functional areas:

- Core Finance
- Position Description Management
- Resume Management
- Travel Management
- Procurement Management
- Budget Management
- Time and Attendance
- Payroll
- Core Human Resources (Core HR)
- Logistics
- Facilities
- Environment
- Aircraft Management

NASA commissioned these analyses to determine which products would best address NASA IFM Program needs. At the conclusion of these BCAs in the summer of 2000, NASA moved forward with the formulation and planning of the Core Finance Module. An open requisition for the solution was placed in the marketplace and Systems, Applications & Products in Data Processing (SAP) emerged as the vendor of choice.

SAP's system, being fully integrated, includes end-to-end Enterprise Resource Planning (ERP) functionality. Licenses for this system are not specific to any functional area, but rather enable access to all of the functionality of the system. SAP can satisfy many of the requirements not directly addressed within the scope of the Core Finance Module. This licensing and architectural scheme encourages NASA to favor the "Best-of-Suite" approach to finding an integrated solution to these twelve functional areas. Further, using SAP for the additional functionality needed by IFMP provides reason for NASA to realign its modules around SAP's functional categories rather than NASA's organizational structure. This results in IFMP implementing far fewer modules, each encompassing more scope than the initial modules. NASA is looking to consolidate the previous modules as described below.²

² Note: the realignment shown only lists the affected modules. Therefore, not all modules are listed.

<u>Original Modules</u>	<u>Potential Alignment</u>
<ul style="list-style-type: none"> • Core Human Resources • Time & Attendance • Payroll • Position Description Management³ 	<ul style="list-style-type: none"> • Human Resources
<ul style="list-style-type: none"> • Logistics • Environment • Aircraft • Facilities 	<ul style="list-style-type: none"> • Integrated Asset Management

Each BCA evaluated NASA's current environment and identified solutions to enable NASA to meet its strategic goals more effectively. These improvement opportunities will result from replacing, upgrading, or eliminating NASA's legacy systems. For each business case the costs, benefits, and risks of system alternatives to the current environment were evaluated. These analyses formed a baseline enabling NASA to move forward and apply the most effective technology to each of the twelve functional areas, with consideration to the potential Module realignment. These improvements will enable NASA and its five Strategic Enterprises⁴ to meet their mission and strategic goals more effectively and efficiently.

It is clear that without the proper tools NASA cannot effectively meet its mission and strategic goals. Business processes that are paper intensive and heavily burdened by administrative processes do not support the management of NASA's mission and strategic planning in a flexible, customer-focused manner. However, these BCAs are only a first step toward change. The BCAs enable NASA to look at each module separately and assess its individual impact on NASA's business drivers. However, these BCAs need to be considered in conjunction with one another when plans for budgeting, sequencing, integration, and implementation are developed. Dependencies between each of these modules need to be understood to create a truly integrated financial management system.

1.2 Mission

The NASA Strategic Plan defines the direction of the organization over the next 25 years. The goals outlined in the Plan are the framework within which NASA entities must execute their responsibilities while supporting NASA's overall mission.

As defined in the Plan, NASA's mission is:

- To advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe and use the environment of space for research;

³ Position Description Management is currently a stand-alone module, however, it may be rolled into the Human Resources grouping at some point in the future.

⁴ NASA is composed of five strategic Enterprises: Earth Science, Space Science, Human Exploration and the Development of Space, Aerospace Technology, and Biological and Physical Research.

- To explore, use, and enable the development of space for human enterprise; and
- To research, develop, verify, and transfer advanced aeronautics, space, and related technologies.

Each NASA entity must operate in accordance with a common vision of serving the United States by benefiting the quality of life on Earth through air and space exploration. Constrained by workforce and budget reductions, Agency management must seek innovative ways to increase program efficiency and effectiveness. This complex situation necessitates that NASA re-examine program management and financial processes, as well as the information systems that support these processes. Ultimately, NASA's mission success depends on continuous evaluation and improvement of program and financial management processes.

The IFM Strategic Plan documents the Agency's requirements for managing financial and related information within an integrated financial management framework. The IFMP mission is:

"... to improve the financial, physical, and human resources management processes throughout the Agency. IFMP will re-engineer NASA's business infrastructure in the context of industry "best practices" and implement enabling technology to provide necessary management information to support the Agency's strategic plan implementation."

The Core HR module will support the IFMP mission by:

- Enabling timely regulatory compliance at less cost;
- Establishing standard business processes across NASA Centers;
- Providing accurate, reliable data to Agency and Enterprise management to track progress against mission; and
- Providing current, accurate reports to both internal customers (e.g., management) and external customers (e.g., Congress).

1.3 Methodology

OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, stipulates:

"...When conducting a cost benefit analysis, the organization should consider alternative means of achieving program objectives by examining different program scales, different methods of provision, and different degrees of government involvement. For example, in evaluating a decision to acquire a capital asset, the analysis should generally consider: 1) doing nothing; 2) direct purchase, 3) upgrading, renovating, sharing, or converting existing government property, or 4) leasing or contracting for services."

Using this guidance, the seven-step methodology described below was developed. This methodology is a composite of the best practices found in government and industry, tailored to effectively evaluate the IFM Program. Additional guidance and format elements taken from OMB Circular A-94 and from NASA guidelines and standard operating procedures were also used in the analysis.

- **Analyze Current Environment** – To obtain the relevant costs and associated benefits for the IFM Program, it is important to understand the current financial management process. The first step was to analyze the current environment. This analysis includes the input and participation of HR representatives and reviews of previous analyses.
- **Determine the Shortfalls of Current Environment** – After the current process was evaluated, the findings concerning the current environment were compared with NASA's stated objectives. The outcome of the comparison enabled shortfalls of the current environment to be determined and identified opportunities for change.
- **Identify Alternatives for Implementing an Integrated Solution** – Once the shortfalls were determined, alternatives were evaluated that could fill the gaps between where NASA is now and where it wants to be in the future. A list of potential alternatives was developed and narrowed down to two viable alternatives, Status Quo and SAP. A detailed cost, risk, and benefit analysis of the viable alternatives was then conducted.
- **Determine the Costs of the Viable Alternatives** – The costs of continuing the current process (Status Quo) and the SAP alternative were calculated for a 10-year period. Development, implementation, and operations and sustaining support costs for the viable alternatives are included in this analysis. The cost of the SAP alternative was examined in the spring of 2001. The cost estimate was based on a bottom up approach built on level of effort from analogous SAP implementations and collaboration with SAP subject matter experts. The findings of the study are documented in the cost section of this BCA and form the cost estimates for the SAP alternative.
- **Identify the Quantifiable and Qualitative Benefits of Viable Alternatives** – Benefits were identified for continuing current operations and for the viable alternative, SAP. For benefits where data was available to quantify a cost avoidance or savings, the benefits were quantified for a 10-year period. Other benefits were qualitatively evaluated for their contribution to fulfilling NASA's business drivers.
- **Identify the Risks Associated with Each Viable Alternative** – Integration complexity, market, technical, and implementation risks were identified and rated for each alternative.
- **Compare the Alternatives** – After the costs, benefits, and risks of the alternatives were identified, comparisons were made between the Status Quo and the SAP alternative. A decision analysis chart that incorporates each of these decision criteria was constructed to reflect the tradeoffs for each of the alternatives.

To obtain relevant information regarding the requirements and immediate needs for the Core HR module, NASA functional personnel actively participated in developing this BCA. In addition, data gathered for previous analyses, where still current and relevant, was used. This data was previously collected from an Agency-wide data call, interviews with NASA personnel, interviews with software subject matter experts, and meetings with vendors of possible software solutions.

1.4 Raines Rules

As noted previously, legislative compliance is one of the driving factors behind NASA's need to integrate its financial management systems. OMB will recommend new or continued funding only for those major system investments that satisfy the eight criteria established in its memorandum "Funding Information Systems Investments."⁵ The memo, commonly referred to as the "Raines Rules," established eight decision criteria as a result of the Information Technology Management Reform Act (ITMRA) of 1996.⁶ ITMRA directs OMB "to establish clear and concise direction regarding investments in major information systems, and to enforce that direction through the budget process." According to the decision criteria outlined in the "Raines Rules" memorandum, government Agencies should minimize risk by:

"...avoiding or isolating custom-designed components to minimize the potential adverse consequences on the overall Project; using fully tested pilots, simulations, or prototype implementations before going to production; establishing clear measures and accountability for Project progress; and securing substantial involvement and buy-in throughout the Project from the Program officials who will use the system."

Additionally, government Agencies should:

"...employ an acquisition strategy that appropriately allocates risk between government and contractor, effectively uses competition, ties contract payments to accomplishments, and takes maximum advantage of commercial technology."

The following explains how the planned replacement and integration of a Core HR system complies with the eight criteria of the "Raines Rules."

1. Investment in major information systems should support core/priority mission functions that need to be performed by the Federal government.

The mission of the IFM Program is to improve the financial, physical and human resources management processes throughout the Agency. IFMP will reengineer NASA's business infrastructure in the context of industry "best practices" and implement enabling technology to provide necessary management information to support the Agency's Strategic Implementation Plan. The Core HR Module will support the NASA IFMP mission by:

- Enabling regulatory compliance with less effort;
- Establishing standard business management and reporting processes across NASA;
- Updating technology to increase efficiency, functionality and flexibility;
- Implementing a single, integrated system;
- Providing management with online access to program and project financial and management information;

⁵ United States Office of Management and Budget, Funding Information Systems Investments, M-97-02, October 25, 1996.

⁶ See Also Clinger Cohen Act of 1996 (formerly known as the Federal Acquisition Reform Act of 1996 (FARA)).

- Providing automated audit trails, data processing and reporting, and security measures;
- Providing timely, reliable data to Agency and Enterprise management to track progress against mission; and
- Providing current reports to both internal customers (e.g., management) and external customers (e.g., Congress, Office of Personnel Management, Department of Treasury).

2. Investment in major information systems should be undertaken because no alternative private sector or governmental source can efficiently support the function.

A number of government Agencies were considered for cross-servicing (DOT, DOI, DOS, DOC, HHS, USDA). However, these Agencies generally do not use leading edge tools; they typically use COTS products of older design that may not be kept up to date to incorporate industry best practices. Using these older tools would increase NASA's overall project risk and would limit the number and extent of potential benefits realized. Additionally, NASA would have limited input in system upgrades and functional enhancements, increasing the risk of not meeting future requirements. An ERP solution implemented NASA-wide will better meet NASA's needs and result in many more benefits for the dollar than a cross-servicing alternative. For a full discussion on the non-viability of cross-servicing, see the Alternative Evaluation section of this BCA. Outsourcing the Core HR processes was also considered, however, the nature of the functions to be performed is mixed, i.e., programmatic and financial or administrative in nature. Programmatic functions, such as making workforce planning and sizing decisions, are inappropriate for outsourcing to the private sector. Financial and administrative functions are more appropriate for outsourcing, but the implementation of an ERP system will largely automate these processes, leaving no appropriate functions to outsource.

3. Investment in major information systems should support work processes that have been simplified or otherwise redesigned to reduce costs, improve effectiveness, and make maximum use of commercial off-the-shelf (COTS) technology.

Business process reengineering (BPR) will examine goals, current processes, and effective use of the selected COTS alternative in redesigned processes prior to implementation. The BPR methodology is specifically tailored to leverage the benefits associated with acquiring COTS applications. This methodology requires at least three reengineering phases: 1) during requirements definition and prior to software selection; 2) after software selection, during implementation; and 3) sometime after implementation when the system has stabilized. NASA completed reengineering during the requirement definition phase and prior to software evaluation.

The traditional approaches to BPR stressed "starting with a clean slate" in developing the "As-Is" processes, analyzing the processes, and designing optimized "To-Be" processes based on the judgment and knowledge of the BPR participants. This traditional approach resulted in custom building the work processes and developing an application to automate the processes.

Newer approaches to BPR, such as the one being used for IFMP, continue the BPR process following the selection of the COTS product in order to leverage the work processes defined by the COTS product itself. Modern COTS-based work processes are developed across a large user base and reflect the combined knowledge of those users to reflect "industry-wide best practices."

Acquiring the industry best practice work processes is a major motivator for pursuing COTS solutions for the business community.

4. Investment in major information systems should demonstrate a projected return on the investment that is clearly equal to or better than alternative uses of available resources.

As presented in this analysis, the COTS solution produces a reasonable ROI when considering the costs, benefits, and risks of the alternative. Furthermore, additional quantitative and qualitative benefits that result from subsequent BPR will be realized once the system is fully implemented.

IFMP supports NASA's continuing efforts to integrate financial processes among geographically disbursed facilities. With the increased level of inter-organizational cooperation, managers need readily available information to support budgeting and management decisions. With an integrated system, it will be more common for resources to be transferred and shared among NASA organizations.

5. Investment in major information systems should be consistent with Federal, Agency, and bureau information architectures that integrate Agency work processes and information flows with technology to achieve the Agency's strategic goals... and specify standards that enable information exchange and resource sharing, while retaining flexibility in the choice of suppliers and in the design of local work processes.

The IFMP plan complies with the policy and guidelines of the Technical Reference Model and Systems Profile, and the Agency's IT Strategic Plan. Use of COTS software and commitment to standards will promote interoperability and flexibility in choosing vendors. Leveraging existing infrastructures as much as possible will promote resource sharing.

NASA remains flexible in its work-process approach because modern COTS solutions are developed in a manner that incorporates industry-wide best work processes. The COTS work processes will strongly influence the reengineering of NASA's existing processes.

6. Investment in major information systems should reduce risk by avoiding or isolating custom-designed components to minimize the potential adverse consequences on the overall project; using fully tested pilots, simulations, or prototype implementations before going to production; establishing clear measures and accountability for project progress; and securing substantial involvement and buy-in throughout the project from the program officials who will use the system.

The IFMP Risk Management Plan states:

“...the purpose of the Program Risk Management Plan is to establish the methods of identifying, analyzing, planning, tracking, and controlling risks at the IFM Program level, consistent with the IFM Program Risk Management Framework. The plan also addresses the top risks currently identified by the Program, specifies how they are mitigated, and describes how the effectiveness of risk mitigation

strategies are determined and monitored. This plan will be continuously updated and kept current with the evolution of the IFM Program and its Projects.”⁷

This BCA recommends a COTS solution with minimal customization. The project life cycle outlines several steps required to bring the system online, including piloting the system at one location prior to deployment Agency-wide. The Project Management Team will have primary responsibility for budget and progress, and will monitor the project by measurable units of work and milestones. Outreach and communication plans will garner involvement and buy-in.

For the purposes of this project, the alternatives were evaluated against the following risk categories: integration complexity, market, technical, and implementation. Overall, the COTS alternative received a low risk score.

In addition, the roles and responsibilities of the IFMP Office include reporting to and remaining accountable to both internal and external customers throughout the life cycle of the Program.

See: National Aeronautics and Space Administration, *Integrated Financial Management Program, Pre-Proposal Conference*, May 24, 2000, p. 19.

7. Investment in major information systems should be implemented in phased, successive chunks as narrow in scope and brief in duration as practicable, each of which solves a specific part of an overall mission problem and delivers a measurable net benefit independent of future chunks.

As stated, the Core HR Module is part of the IFMP. This Program is broken down by Modules and the implementation of the Modules is further broken down into four phases: Formulation, Agency Design, Pilot Center Implementation and Rollout. Funding for each project will be contingent upon the approval of individual Project Plans and a separate schedule and budget will be generated and tracked for each Module. Furthermore, each Module will be measured against its contribution to the functional drivers, performance measures, and minimum success criteria specific to that Module.

While the overall improvements in service envisioned by the IFMP are contingent upon the successful implementation and integration of all the projects, each of the Modules represents standalone functionality that will independently provide benefits to the Agency apart from the other Modules. Lessons learned from the implementation of previous IFMP Modules can be applied to the Core HR Module.

⁷ National Aeronautics and Space Administration, *Integrated Financial Management Program, Program Risk Management Plan, Version 1.0*, July 25, 2000, p. 3.

8. Investment in major information systems should employ an acquisition strategy that appropriately allocates risk between government and contractor, effectively uses competition, ties contract payment to accomplishments, and takes maximum advantage of commercial technology.

Acquisition Planning with Risk Management will be conducted in accordance with Federal guidelines and NASA's established procedures. NASA enlisted an independent assessment consultant to provide acquisition-consulting support. NASA's Acquisition Strategy for the Core HR Module includes use of pre-existing contract vehicles to streamline the acquisition process. Separate acquisitions will be conducted for software and implementation services to minimize reliance on a single contractor, thereby reducing risk.

The software acquisition strategy included in-depth software demonstrations of multiple vendors prior to software selection, using NASA-developed demonstration scenarios.

The acquisition of implementation services will utilize the GSA Schedule. Unique features of this acquisition include use of a blanket purchasing agreement with incremental task orders being issued as work progresses; use of a period of understanding in which NASA will "test drive" the implementation vendor to confirm their selection with a backup vendor standing ready to step in; and use of an incentive fee in conjunction with fixed price tasks and fixed labor rates to optimize vendor performance. Payment milestones will be established jointly with the vendor within each task order. Earned Value principles will be applied in monitoring performance. Each of these features is designed to allocate risk fairly and appropriately between the government and the contractor.

See: National Aeronautics and Space Administration, *Integrated Financial Management Program, Pre-Proposal Conference*. May 24, 2000, pp. 34-40.

1.5 Global Assumptions

NASA identified the following global assumptions:

1. The selected Core Financial system is SAP R/3 and includes mySAP functionality.
2. The HQ Program Office will have a Program Management Support contractor and an Acquisition Support contractor who will provide independent assessment for ongoing projects. The System Integration Project will have a contractor that provides both ERP system integration skills and IT architecture development and production support skills. Each Pilot-implementing Center will have its own system implementation contractor. The implementation contractor will support transition activities at follow-on Centers, focusing on "what" and "how" but not actually performing transition tasks. All Centers will use their standard support services contractors for transition activities (data conversion, training, and legacy interface).
3. Each software module implementation will be its own project, managed by a Center.
4. NASA will adopt SAP's data dictionary as the Agency's data dictionary.
5. Software modules will be transitioned to the nine remaining Centers after implementation is completed at the Pilot Center. The Lead Center for a module implementation is also the Pilot Center.

6. Phasing for module implementation: Formulation, Agency Design, Pilot Center Implementation, and Rollout.
7. The Formulation phase will occur before Agency Design. The Formulation phase involves developing a risk management plan and procedures, developing Program Commitment Agreement (PCA) addendum documents, and establishing the baseline for the Agency Design phase.
8. The implementation team will develop an Agency-wide solution and standardize functional business processes during the Modules' Agency Design Phase.
9. Each software module project is responsible for implementation services.
10. Each project will develop its function specific reporting. Overall reporting strategy is the responsibility of the Integration Project at MSFC. The Integration Project is currently exploring the Business Warehouse (BW) capability of SAP, which capitalizes on the integrated database architecture of SAP for strategic information delivery and reporting.
11. The Centers will continue to utilize local support service contractors for legacy systems and any interfaces to the new system.
12. NASA personnel assigned to the module project will be fully dedicated to the efforts of the project.
13. The Center implementations (following Pilot implementations) will concentrate on data conversion activities, Center-specific interface development and end user training. It is expected that data conversion will be kept to a minimum and that only a few Center-specific interfaces will be implemented prior to go-live. The remaining interfaces will be implemented following the go-live date. It is expected that Center-specific configuration activities will be very limited.
14. There will be no customization of the Agency solution during Rollout at the remaining Centers. Locally enhanced functionality will be accepted, business process changes to the application will not.
15. The acquisition and management of hardware and software to support each of the modules will be centralized. MSFC will acquire the system executive hardware, systems software and tools necessary to create a development environment, training environment, and integration testing environment at the test facility and a production environment at the NASA ADP Consolidation Center (NACC). All system hardware and software above the desktop level will be managed at the NACC, which supports all the projects. The projects will use NASA's high-speed wide area network to access the systems at MSFC. The project teams will not staff IT personnel for systems administration, database administration, etc. since these capabilities will be provided by MSFC.
16. For this analysis, it is assumed that NASA's current desktop computing environment and associated networks are adequate to support all of the considered alternatives. The IFM Program will not procure client level desktop hardware and will not incur any cost associated with the acquisition of this hardware.

2 CASE FOR CHANGE

This section outlines NASA's vision of the future HR operating environment. Included in this section are the factors driving NASA to a fully integrated financial management system, the functional aspects of Core HR that influence the future environment, the alignment of the functional drivers with the Agency drivers, and the improvements that should result from replacing the Core HR legacy systems.

2.1 Vision and Drivers

NASA has determined that the implementation of an IFM system supports the Agency's mission by improving the processes, tools, and management systems supporting personnel and physical resources. The implementation of a Core HR system will increase operational efficiency and mission effectiveness, improve the ability to manage the Agency's human capital, improve stakeholder satisfaction, increase financial accountability, and enhance information exchange.

By implementing a new Core HR system and shifting the focus of work within the Centers' HR organizations, NASA can leverage technology to manage the workforce as a strategic resource. In its vision for the future, NASA will have the following capabilities and processes supporting workforce management:

- Strategic assessment capability linking competencies to Enterprise future needs for better workforce planning;
- Workforce allocation tools to deploy people to highest priority missions;
- Rapid access to current HR information by managers and staff for decision support;
- Optimized use of training resources and effective development of organizations, managers and professionals;
- Efficient, consolidated HR operations, including electronic record keeping and report generation; and
- Center HR offices that have transitioned from a processing to a consultative role.

As the IFM Program was reconstituted during early 2000, five Agency-wide business drivers were established. These business drivers, identified in Exhibit 8, support NASA's transformation from its current decentralized business systems to a system that is seamlessly integrated throughout all NASA Centers. The complete system will enable NASA to carry out its financial management functions, execute financial operations of the Agency, and report the Agency's financial status to external entities more effectively. Aligned with these business drivers are the functional drivers specific to the Core HR module. These functional drivers establish the vision for the future operating environment of Core HR.

Exhibit 8: Business and Functional Drivers

Business Driver	Core HR Functional Drivers
1 Provide timely, consistent, and reliable information for management decisions	<ul style="list-style-type: none"> • Strategic workforce planning and allocation ability based on competencies • Link employee competencies, future needs and employee development to ensure strategic requirements
2 Improve NASA's accountability and enable full cost management	<ul style="list-style-type: none"> • Workforce allocation to highest priority programs and projects • Time and Attendance and Labor Distribution to tie employee cost to programs and projects • Improved management of training, awards and salaries
3 Achieve efficiencies and operate effectively	<ul style="list-style-type: none"> • Improve efficiency of operations through: consolidation of processes and procedures, self service input of data and verification, automated work flow, faster processing of transactions and consistent data quality • Ability to move from transaction based orientation to consultative services for: organizational effectiveness, succession planning, career path management, and change management
4 Exchange information with customers and stakeholders	<ul style="list-style-type: none"> • Share personnel, hiring and competency information across Centers • Employee self service capabilities • Management self service capabilities
5 Attract and retain a world class workforce	<ul style="list-style-type: none"> • Improve planning and development based on competencies • Accelerate personnel actions

The ultimate success of NASA's mission of discovery depends in large part on the strategic management of its human capital resources. In order to meet the Core HR functional drivers and NASA's business drivers, in the context of NASA's decentralized environment, the implementation of a robust, Agency-wide Core HR system is critical to success.

2.2 As Is Condition

NASA's principal automated HR/Payroll system is the NASA Personnel/Payroll System (NPPS). It provides administrative assistance for employee personnel and payroll processing and record keeping activities. The system allows users to enter data, view employee records, process payroll, and select and schedule hard copy reports. The Human Resources staff at each NASA installation utilizes NPPS independently.

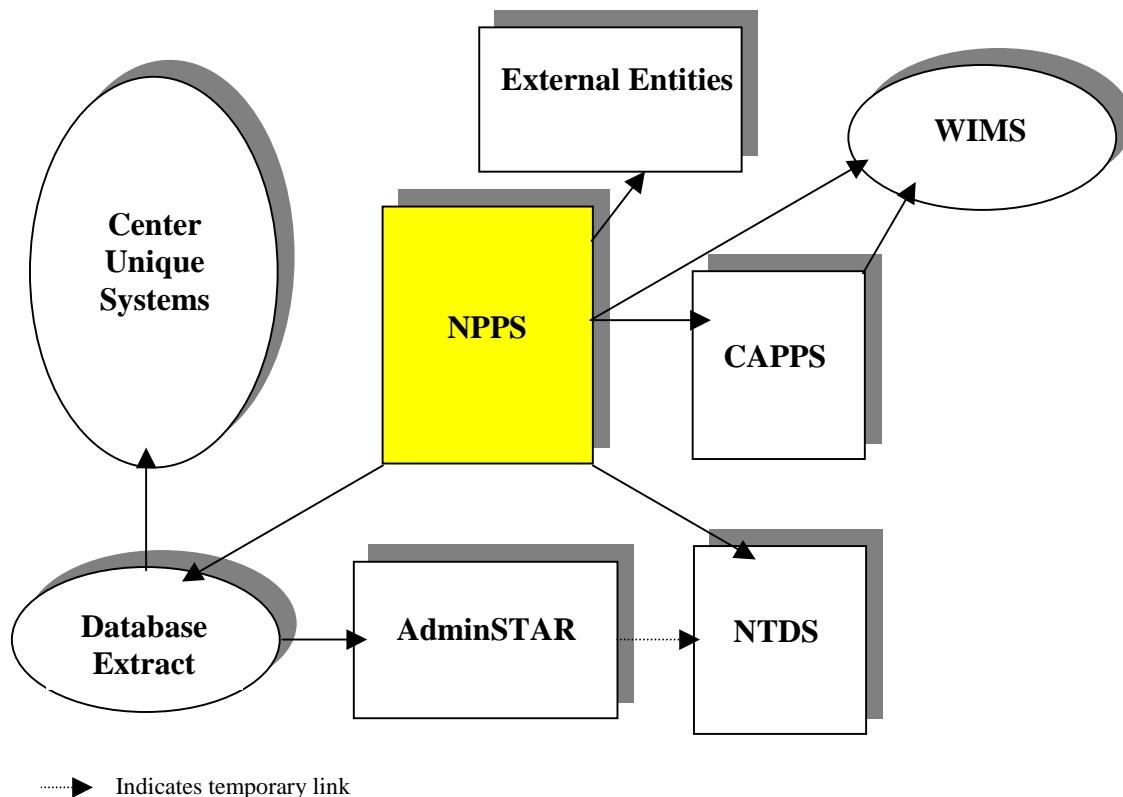
The current system's user community is comprised primarily of personnel office administrative staff members who are specially trained to use the system to perform clerical processes. The system supports a very limited subset of HR business processes, and it does not meet the needs of personnel management specialists and managers. NASA Personnel Directors have recognized the current system does not provide the comprehensive, automated tools necessary to meet their current and future HR requirements.

NASA's current personnel related systems can be broadly grouped into two categories: Agency-wide and Center-specific. The Agency-wide systems are mainframe-based, and are loosely

integrated at the data level. In addition to these systems, each NASA Center and Headquarters have existing personnel systems that are custom developed to support each installation's unique business process requirements. The system and interfaces that support the Core HR functions are illustrated in Exhibit 9 and are described below. The shaded box highlights NPPS, the major system that houses the majority of the HR data.

On an Agency-wide level, the personnel related functions of NPPS require the system to interface with the NASA Training and Development System (NTDS) and the Administrative Schedule Tracking Access Report (AdminSTAR).

Exhibit 9: Core HR Systems and Interfaces



At the Center-specific level, the Core HR functions of NPPS require the system to interface with Center-unique systems. Some of these systems include:

- Marshall** Personnel Awards System (PAS)
- MSFC Personnel Information System (MPIS)
- Kennedy** Space Transportation Accounting and Resource System (STARS)

Glenn Phone File Maintenance System (PHONE)
Security Information Management System (SIMS)
Master Data Locator System (MDLS)
TID Personnel Tracking System (TIDBITS)
Lewis On-Line Travel Service (LOTS)
HR Information System (HRIS)

External to NASA, NPPS interfaces with the Office of Personnel Management (OPM), Department of Treasury, and Employee Express (EE)⁸ systems. Payroll data is extracted from NPPS and written to a flat file that is sent to the Department of Treasury on a biweekly basis.

Although the Core HR activities of NPPS are centrally located at MSFC, the personnel business activities continue to be functionally supported by personnel at each Center. Critical business interfaces to NPPS are provided to each Center.

On a bi-weekly basis CAPPs (Consolidated Agency Personnel/Payroll System) brings Payroll and HR data from each installation together in a single database to allow for Agency-wide reporting. Although CAPPs is easier to query than NPPS, it is neither flexible nor fast enough in its current state. CAPPs produces monthly and quarterly reporting of personnel actions and status to the Central Personnel Data File managed by OPM.

The NTDS is the legacy Agency-wide software application that assists the training community in reporting training and Agency level HR and Organization Development activities at NASA installations. NTDS satisfies a core set of processing needs of all NASA installations. Additional applications, which interface with the NTDS database, are developed at each Center to satisfy specific processing needs of the installation. AdminSTAR is the replacement for NTDS.

AdminSTAR is a COTS (Commercial Off-The-Shelf) product that uses a centralized database to assist the Agency training community in the development and reporting of training activities at all NASA installations. It provides the capability for employees to generate training requests and for supervisors to approve or reject the requests. The system allows training officers to track and report on training and related costs to NASA management and to OPM. The capability also exists to schedule classrooms, materials, and instructors.

2.3 Gap Analysis

NPPS and the other HR related systems do not provide the functionality that is increasingly needed by NASA managers and personnel offices. NPPS was primarily built for three purposes: 1) process personnel transactions, 2) process the payroll, and 3) maintain an employee database

⁸ EE is operated by the Office of Personnel Management (OPM) and allows employees to directly update their personal information via the web. EE uploads data to NPPS daily; however, NPPS only transfers changes to EE on a biweekly basis. Therefore, if employee data is updated in NPPS first, EE will not receive the data for up to two weeks.

for reporting purposes. It does these functions adequately, though it is not a convenient, fast, or flexible reporting system.

Fundamentally, NPPS and the auxiliary legacy HR systems suffer from the following deficiencies:

- The legacy systems only track limited personnel data – they do not support workforce planning, program/project cost management, or training needs;
- Program Managers cannot see FTE, personnel data and costs for people working on their projects;
- The systems provide no tools to manage competencies from a current skills basis or a future needs basis – competency studies and planning are ad hoc efforts and are quickly outdated;
- People get paid – however, the payroll and HR systems are strictly transaction based with minimal strategic capability;
- As a 1980's mainframe system, NPPS has few users, a difficult interface, inaccessible data and narrow functionality;
- NPPS gives managers no way to request services or get data on subordinates;
- Fifty small, Center-unique systems interface bridges have been developed and deployed to fill some gaps; and
- NPPS does not enable consolidation of back office HR operations such as transaction processing and record keeping.

NASA's legacy HR systems also require significant manual intervention. Several key processes could be automated, including:

- Supporting transfers of employees between Centers with minimal processing and maintaining a complete NASA employment record.
- Creating a data network that links personnel system data across all Federal Agencies and the OPM in support of the Federal Human Resources Technology Council's initiative.
- Maintaining organization historical data. Retaining organization data (to lowest organizational level), searchable on a point-in-time basis, such as: organization names, organization codes, organization charts, organization functional statements/charters, employee competencies, job titles, and the distribution of employee skill types and competencies, etc.
- Maintaining historical files that document the recruiting and staffing process, including delegated examining authority, in a manner that provides a complete audit trail of all actions. This is particularly important in responding to data calls associated with grievances, appeals, equal opportunity inquiries, and veterans' benefits considerations.
- Providing automatic notification of new hires to appropriate offices including gaining organization, facilities, security, new hire orientation, training, medical/clinic, drug testing program manager, information systems (i.e., ODIN), and transportation.

Exhibit 10 lists the current Core HR system drawbacks specific to the Agency business drivers.

Exhibit 10: Current System Drawbacks

Business Driver	Current System Drawbacks
Provide timely, consistent and reliable information for management decisions	<ul style="list-style-type: none"> • Inability to access personnel records at a centralized point. • Inability to extract required performance criteria (embedded in position descriptions) to generate performance appraisal plans. • Inability to provide electronic completion, approval and recording of the performance plan and resulting score to appropriate parties. • Inability to electronically generate, validate, approve, process and maintain monetary and honorary, SES, and incentive awards.
Improve NASA's accountability and enable full cost management	<ul style="list-style-type: none"> • Inability to analyze current employment costs and create what-if scenarios that convert employee information into dollar amounts as required by full cost accounting. • Inability of system to calculate the change in cost between actual and full performance level staffing.
Achieve efficiencies and operate effectively	<ul style="list-style-type: none"> • Fragmented, non-standardized system creates need for redundant entry of personnel data. • Lack of standard reports (e.g., leave) requires the programming of additional supernatural queries, a skill few NASA employees possess. • NPPS requires input on a command line for each screen before advancing to another screen.
Exchange information with customers and stakeholders	<ul style="list-style-type: none"> • Inability to access personnel records at a centralized point. • Lack of integration with Core Financial systems creates data completion issues. • Inability to extract required performance criteria (embedded in position descriptions) to generate performance appraisal plans. • Inability to provide electronic completion, approval and recording of the performance plan and resulting score to appropriate parties. • Inability to electronically generate, validate, approve, process and maintain monetary and honorary, SES, and incentive awards and promotions.
Attract and retain a world class workforce	<ul style="list-style-type: none"> • Inability to record employee skills and competencies and tie them to training and development plans that are tied to the performance management system so that strategic alignment is established. • Inability to provide new employees with information on-line, including benefits enrollment completed through either an electronic form or web-based application. • Inability to provide employees on-line access to their Official Personnel File (OPF) information via self-service.

3 ALTERNATIVE IDENTIFICATION

This section describes the process for identifying alternatives and for determining their viability for further study. Viable alternatives are evaluated from a cost, benefit, and risk perspective in the subsequent sections of the report.

In addition to the alternatives listed below, a “big bang” strategy for Core HR, Payroll, Labor Distribution, and Time and Attendance was explored. This “big bang” approach would be a single phased implementation of a system supporting all the functionality for Core HR, Payroll, Labor Distribution, and Time and Attendance.

In light of NASA’s choice of SAP for the Core Finance module, a gap analysis, completed in January 2001, was conducted to evaluate SAP’s ability to meet NASA’s HR requirements. The analysis determined that SAP does not fully meet NASA’s HR requirements at this time, but SAP’s functionality will be ample upon federalization of the product, which is already underway. NASA’s most pressing HR need at this time is for a new, consolidated Core HR system. The current system failures are documented in the Case for Change section of this BCA. The two-phased implementation approach is a strategic solution to balance Agency priorities with budget constraints and the maturity of commercial software products for the Federal arena. Given these conditions, it was deemed that a two-phased implementation with Core HR being implemented first, followed by a second phase for implementation of Payroll, Labor Distribution, and Time and Attendance, was the better approach. Therefore, the alternatives in this Business Case are all evaluated in light of a two-phased implementation strategy. (For further details on the Human Resources implementation strategy, see Appendix A.)

Upon selecting SAP for the Core Financial system, NASA reexamined the “Best of Suite” strategy. NASA determined that the “Best of Suite” approach is a best practice, utilizing today’s available ERP functionality, and yields substantial benefits over a “Best of Breed” approach. The “Best of Suite” approach has a lower total cost of ownership because there are fewer systems to maintain, fewer projects to manage, less project management costs, fewer systems to learn, and less hardware. Additionally, because there are fewer temporary and permanent interfaces, there is less fragmentation and less interface development and maintenance costs. Since an ERP solution facilitates help desk support (one system to support), the change management effort (one new system to learn), and provides a common look and feel for all users, a “Best of Suite” approach leads to improved user satisfaction and reduces users’ learning curve. Additionally, implementation is simplified, resulting in a faster realization of benefits. Risk is also reduced since integration is easier, there is a single software source, and the project is easier to manage. NASA performed a gap analysis of the SAP functional capabilities to NASA’s core business functions and this analysis concluded that there is a high degree of fit between SAP’s functionality and NASA’s requirements. Due to the selection of SAP for Core Finance, the substantial benefits of pursuing a “Best of Suite” approach, and SAP’s ability to meet NASA’s functional Core HR needs, the COTS alternative evaluated for this BCA is SAP.

In 1996, NASA successfully transitioned from ten separate Center payrolls to establish the Consolidated Payroll Office (CPO). The enhancements from the consolidation and the formation of the CPO allow NASA to adequately meet its current payroll needs. As a result, a payroll system upgrade or replacement, while necessary in the long run, is not an immediate high priority item for NASA.

3.1 Requirements

NASA conducted a thorough requirements analysis and identified over 200 requirements for an integrated HR/Payroll management system. Of these technical and functional requirements, nearly sixty were identified as breakthrough requirements.⁹

3.2 Potential Alternatives

Potential alternative approaches to implementing an enhanced Core HR system for NASA were identified that would:

- Meet NASA's requirements for personnel management;
- Take into account the current environment and the impact of changes on the organization, its existing systems, and its underlying information technology (IT) infrastructure; and
- Incorporate the ideals of the IFM Program and address the drawbacks of the current system and business processes.

As depicted in Exhibit 11, six potential alternatives (in addition to the Status Quo) were identified.

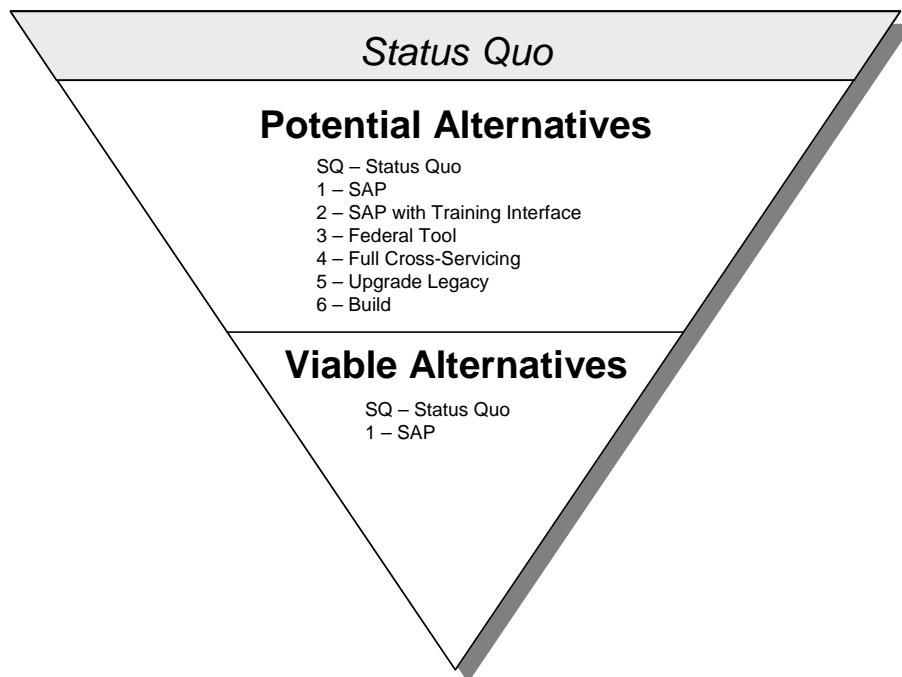
⁹ Breakthroughs: A difference from the way that we do things now that will result in a significant improvement in productivity and/or customer service.

Exhibit 11: Potential Alternatives

Alt #	Alternative Title	Alternative Description
SQ	Status Quo	<p>This alternative is defined as "the do nothing approach" with the exception of performing mandatory upgrades of the current functional management systems to meet Federal, State and NASA requirements. This alternative includes maintaining the processes and information technologies that currently comprise the HR systems. These systems include:</p> <ul style="list-style-type: none"> - NPPS - CAPPs - NTDS - AdminSTAR - EE - Center-uniques
1	SAP	<p>This alternative is defined as acquiring and implementing the SAP R/3 software package to replace the current HR legacy systems. These systems include:</p> <ul style="list-style-type: none"> - NPPS - CAPPs - NTDS - AdminSTAR - EE - Center-uniques
2	SAP with Training Interface	<p>This alternative is defined as acquiring and implementing the SAP R/3 software package to replace the current HR personnel legacy systems and continuing to maintain the training legacy systems. The HR personnel legacy systems include:</p> <ul style="list-style-type: none"> - NPPS - CAPPs - EE - Center-uniques <p>The training legacy systems include:</p> <ul style="list-style-type: none"> - AdminSTAR - NTDS
3	Federal Tool	This alternative is defined as using a Core HR COTS application currently employed at another Federal Agency. For this alternative, NASA will only consider Agencies utilizing a federalized COTS package.
4	Full Cross-Servicing	This alternative is defined as cross-servicing the Core HR application <i>and</i> functional personnel with another government Agency.
5	Upgrade Legacy	This alternative is defined as programming NPPS and the other legacy systems with identified enhancements to satisfy NASA's requirements and enable NASA to better fulfill its business drivers.
6	Build	This alternative involves custom building an entire Core HR system. This would involve writing code and does not take advantage of commercially developed systems that satisfy most core requirements.

3.3 Alternative Evaluation

The list of potential alternatives presented in Exhibit 11 was narrowed to two viable alternatives as illustrated in Exhibit 12.

Exhibit 12: Narrowing the Alternatives

Each of the potential alternatives was evaluated in the context of NASA's environment, operations, and requirements to determine their viability as a system solution. This evaluation concluded that the SAP with Training Interface, Federal Tool, Full Cross-Servicing, Upgrade Legacy, and Build alternatives were not viable for the reasons detailed in the following paragraphs. After eliminating these alternatives, a full evaluation of the costs, benefits, and risks of the remaining viable alternative was conducted and compared to the baseline. The results of this full evaluation are provided in the remaining sections of this report.

3.3.1 Non-Viable Alternatives

Five of the alternatives initially identified were determined to be non-viable. The rationale for designating each of these alternatives as non-viable is provided below.

3.3.1.1 SAP with Training Interface

This alternative is based on acquiring additional SAP licenses to replace the Core HR personnel legacy systems and continuing to maintain AdminSTAR for training functionality. This alternative would require maintaining two separate systems as well as the interface between them. The training legacy systems consist of the NASA Training and Development System (NTDS) and the Administrative Schedule Tracking Access Report (AdminSTAR) system. The NTDS is the Agency-wide legacy software application that assists the training community in reporting training and Agency level HR and Organization Development activities at NASA installations. AdminSTAR is the replacement for NTDS and is a COTS product that uses a centralized database to assist NASA's training community in the development and reporting of training activities at all NASA Centers. AdminSTAR was always envisioned as an interim

solution, but recent developments have greatly reduced its useful system life. Most importantly, the vendor has recently stopped supporting this product. This means that NASA is responsible for all future maintenance, upgrades, and enhancements to the product. This places considerable risk on NASA since there is no vendor to share the cost of maintaining the application. Another setback to AdminSTAR is that support within NASA's user community for the product has largely faded. Furthermore, with the selection of SAP for Core Finance and the ability of SAP's training functionality to meet NASA's needs, there is little justification for a separate training system. In light of these significant developments, most notably the discontinued vendor support of AdminSTAR, there is not adequate reason to explore this option further.

3.3.1.2 Federal Tool

This alternative is defined as using a Core HR COTS application currently employed at another Federal Agency. For this alternative, NASA will only consider Agencies utilizing a federalized COTS package. The Agencies considered for cross-servicing include the Department of Transportation (DOT), Department of Interior (DOI), Department of State (DOS), Department of Commerce (DOC), Health and Human Services (HHS), and Department of Agriculture (USDA).

NASA has selected SAP for its Core Finance Module project, which is an Enterprise Resource Planning (ERP) system that encompasses a fully integrated set of functionality, from asset management to human resources management. There are many benefits associated with an ERP solution. Underlying SAP's functionality is a common database, which ensures that data is immediately updated and available real time, eliminating issues of data integrity that arise from reconciling multiple, overlapping databases. Additional benefits of an integrated environment include streamlined processes, increased efficiency, improved data security, and organization wide planning and reporting capabilities. In addition to the benefits of an integrated environment, there are also significant advantages with regards to cost and technical complexity. The cost implications and technical complexity of a non-integrated environment arise because data dependencies will exist. Specifically, the Core HR system could use data from the following systems: Position Description Management, Resume Management, Payroll (a complex interface), Core Financials, and Budget. Additionally, there would be one-way interfaces to Time and Attendance, Travel, external entities, applicable applications of the cross-servicing Agency, and other IFM modules that may not be immediately linked with Core HR. Building and maintaining these interfaces introduces costs that would not exist in an integrated environment. In addition to the added interface costs, the more complex environment negatively affects the availability of real time data, data integrity, the ease of data sharing, and data security. Data security is particularly important for Human Resources due to the sensitive nature of the personal information. The Federal Tool solution would not realize the benefits of an integrated system and, instead, would increase costs and technical complexity.

As previously mentioned, the SAP licenses that NASA purchased for Core Finance are not limited to the Core Financial functionality within SAP. NASA can configure any functionality within the SAP R/3 system to meet its needs. Therefore, from a cost perspective, a non-SAP solution for Core HR fails to take advantage of the SAP licensing structure and the overlap of seats (i.e., users) between modules.

Business process reengineering is generally a part of any software implementation effort and will be required here. However, under the Federal Tool alternative, NASA will have to re-engineer

its business processes to match those of the provider Agency. This means NASA loses autonomy in determining its own business processes and may have to conform to business processes that do not best meet NASA's needs. Additionally, any degree of change management is challenging because it requires users to change conditioned work habits and loyalty to NASA specific business processes; therefore, heavy resistance may occur. Extensive training and communication will be required to alleviate this.

The Agencies considered for the Federal Tool alternative (DOT, DOI, DOS, DOC, HHS, USDA) generally do not use leading edge tools. They typically use COTS products of older design that may not be kept up to date to incorporate industry best practices. This increases the risk of the overall project and cost associated to maintain these antiquated systems. Additionally, NASA will not have control over the technical operations and maintenance of the Federal Tool solution and will have limited input in system upgrades and functional enhancements. This may also impact requirements that are currently met, but may not be met in the future as a result of upgrades or modifications. Also, NASA may be forced into additional business process reengineering as a result of the upgrades.

The Federal Tool alternative is particularly susceptible to schedule over runs due to the impact of integration issues with the cross-servicing Agency's legacy systems and associated applications; the degree of tailoring required to reconcile the cross-servicing Agency's and NASA's business needs; and the level of cooperation and coordination between the Agencies.

Additionally, few Agencies have the capacity to accommodate another Agency with 20,000 employees. An initial review failed to identify any Federal Agency that has a COTS HR product that can accommodate an additional workload of this scale.

The Federal Tool alternative has few benefits, but has added cost and complexity over other alternatives. The drawbacks of the Federal Tool solution not only include a high degree of technical complexity and integration issues, but also place limits on NASA's ability to control and change its business processes. Given these considerations and NASA's selection of SAP for Core Finance, the Federal Tool alternative does not make sense within NASA's environment and was deemed non-viable.

3.3.1.3 Full Cross-Servicing

This alternative is defined as cross-servicing the Core HR application *and* functional personnel with another government Agency. For this analysis cross-servicing with the National Finance Center (NFC) was used as a benchmark. This alternative is similar to the Federal Tool solution with regards to using another Agency's Core HR software. In addition to the issues discussed under the Federal Tool alternative, which also apply to this alternative, there are a number of additional issues that arise from cross-servicing functional personnel.

This alternative is high risk because the NFC was identified as the only organization that has the possible qualifications to offer Full Cross-Servicing to accommodate NASA's volume. This Full Cross-Servicing solution is government built and may not be easily supported due to the age of technology and complexity of the system. The Agency with the Full Cross-Servicing solution has the possible qualifications to scale up or down in volume of users for NASA. However, adding NASA's Core HR functions to an architecture that is continuously being expanded to

meet growth is inherently risky because the system may be in danger of becoming overloaded. Capacity aside, Agencies offering full services have not demonstrated the capability or flexibility in fully meeting customers' functional and business needs. Adding another Agency's processes to an already complex interfaced environment would pose complications to NASA's HR business and technical environment.

The cross-servicing provider must also share a skilled workforce among many Agencies. A Full Cross-Servicing provider would not provide NASA with exclusive support; therefore, the quality of NASA's customer service to employees could potentially suffer. Additionally, this solution would most likely be poorly received by NASA employees, due to the fear of losing comprehensive customer service and fear of change in the level of comfort with current HR support. Should the Cross-Servicing Agency agree to provide a dedicated staff for NASA by augmenting its staff, NASA would most likely have to incur this cost. This makes the alternative even less financially feasible.

It would be difficult for the NASA HR community to commit to the level of change management required for Full Cross-Servicing. Although transitioning would allow NASA HR professionals to spend more time acting in consultative roles, this change may still result in heavy resistance because Full Cross-Servicing infers that a portion of NASA's HR staff would be re-deployed elsewhere in the NASA environment.

Furthermore, Full Cross-Servicing is even more susceptible than the Federal Tool alternative to schedule overruns due to greater levels of project complexity, cross Agency agreements and coordination, greater number of milestones, and time sensitive critical paths.

The issues associated with cross-servicing functional personnel with another Agency, combined with the issues surrounding cross-servicing the Core HR application with another Agency as previously discussed under the Federal Tool alternative, outweigh any benefits of a Full Cross-Servicing strategy. Therefore, a solution with less risk and higher benefits should be explored.

3.3.1.4 Legacy System Upgrade

This alternative is based on the current legacy systems that support the Core HR functions for NASA. Starting with the existing system as a baseline, this alternative calls for the minimum modifications or changes that NASA has determined are necessary to provide a feasible Core HR solution for the Agency. This alternative primarily involves modifying or developing system interfaces to integrate existing systems with one another, installing common functionality across the Centers, and eliminating critical weaknesses associated with lack of data integrity and duplication of effort. Upgrading the legacy systems is not a sustainable solution for NASA. It would require a large investment in programmers to code the system and build interfaces. Over the next ten years NASA would continually need to upgrade the system to keep pace with technology and Federal IT guidance. This would result in continued additional cost to NASA. Therefore a more sustainable solution should be explored.

3.3.1.5 Build

Although building a custom Core HR system for NASA is an alternative, it is not viable given the current executive branch guidance described below.

Franklin O. Raines, former OMB director, defined criteria for funding information systems investments. These criteria, commonly referred to as the “Raines Rules,” were developed as a result of the Information Technology Management Reform Act (ITMRA) of 1995, which directs OMB “to establish clear and concise direction regarding investments in major information systems, and to enforce that direction through the budget process.” According to these decision criteria, government Agencies should minimize risk by—

...avoiding or isolating custom-designed components to minimize the potential adverse consequences on the overall project; using fully tested Pilots, simulations, or prototype implementations before going to production; establishing clear measures and accountability for project progress; and securing substantial involvement and buy-in throughout the project from the program officials who will use the system.

Additionally, government Agencies should “employ an acquisition strategy that appropriately allocates risk between government and contractor, effectively uses competition, ties contract payments to accomplishments, and takes maximum advantage of commercial technology.” A COTS solution would not only allocate the risk between the government and the contractor, but also would take advantage of commercial technology and the associated cost efficiencies.

Several COTS Core HR products for the Federal arena are available that meet most of NASA’s needs, making it possible for NASA to avoid building a custom system. Due to the availability of these COTS systems and the executive branch guidance highlighted above, this alternative is rendered non-viable.

3.3.2 Viable Alternatives

After eliminating the above five alternatives as non-viable, detailed cost, benefit, and risk analyses were performed on the remaining viable alternatives, Status Quo and SAP. The complete analysis for these two viable alternatives is presented in the following sections of this document.

4 COST ANALYSIS

4.1 Global Cost Assumptions

In estimating the 10-year life cycle costs for the Status Quo and SAP alternative, the following assumptions have been applied:

- **Government Wage Rate:** The average salary for NASA civil servants is \$70,887 with a 43 percent load rate for benefits. The total loaded salary used in this analysis is \$101,368 per year or \$390 per day.
- **Contractor Wage Rate:** The contractor wage rate is \$364,000 per year or \$1,400 per day.
- **Contractor Expenses:** Contractor expenses are estimated at 15 percent of the total contractor costs per year.
- **Civil Servant / Contractor Split:** During the Formulation and Pilot phases a 15 / 85 (civil servant to contractor) split is assumed for the recommended alternative (SAP). During the Rollout to remaining Centers, a 55 / 45 (civil servant to contractor) split is assumed.
- **Discount Rate:** The real discount rate is 3.2 percent. This is based on Appendix C of OMB Circular A-94.
- **Inflation Rate:** The current inflation rate is 2.2 percent. This is based on Appendix C of OMB Circular A-94.
- **Base Year:** The base year for all constant year estimates is FY01.
- **Life Cycle:** The Life Cycle of the new system is 10 years and beginning in FY02.
- **Operations and Sustaining Support:** The Program office will incur these costs for the remainder of the fiscal year following implementation, plus an additional two fiscal years beyond that. After this two-plus year period, the Enterprise will pay the Operations and Sustaining Support costs via a charge back to the NACC.
- **Functional Staff:** It is assumed that none of the alternatives will result in a cut in NASA functional staff. Therefore, functional FTEs are not included in the cost estimates.
- **Number of Users:** This is the total number of users of the Core HR system. These users are divided between technical, functional, casual, and intermittent users for training purposes.
 - **Technical:** 58
 - **Functional:** 271 civil servants (this includes 171 for Personnel functions and 100 for training functions) and 27 contractors who perform data entry of key personnel actions.
 - **Casual:** 3,000 (this includes NASA employees who need limited access to the Core HR system to review and approve personnel actions).

- **Intermittent:** 20,000 (this includes employee self-service).
- **COTS Alternative:** The Core HR functionality of the Best of Suite software chosen for the Core Finance Module (SAP) is assumed to be the default software for the Core HR module, as directed by the Non Advocate Review, since there is no overwhelming reason (fatal omission) to deviate.
- **SAP License Costs:** SAP license costs are not included. This cost is accounted for on an aggregated level to take advantage of vendor volume discounts. Additionally, since users and their corresponding licenses overlap between modules, the number of licenses needed for each module, if purchased separately, would fluctuate depending on implementation timing (i.e., licenses purchased for earlier modules would not have to be repurchased for later modules). Therefore, the license costs have not been allocated to specific modules.
- **Rounding Discrepancies:** Due to rounding included in the cost tables, some cost figures may differ slightly (+/- 2).
- **Development and Implementation Period:** The Development Period includes three phases (Formulation, Agency Design and Pilot) and the Implementation Period includes the Implementation at the Remaining Centers. The length of the development and implementation period for the Full COTS alternative is as follows:

Exhibit 13: Length of Development and Implementation Phases

Phase	Recommended Full COTS Alternative SAP
Phase 1 Formulation	<i>9 months</i>
Phase 2 Agency Design	<i>6.5 months</i>
Phase 3 Pilot	<i>5.5 months</i>
Phase 4 Implementation at Remaining Centers	<i>9 months</i>
Total Length	<i>30 months</i>

4.2 Status Quo

These are the costs to maintain the Core HR legacy systems. This includes the personnel portion of NPPS, the Consolidated Agency Personnel/Payroll System (CAPPS), the National Training Database System (NTDS), AdminSTAR, and the Center-unique systems.

4.2.1 Enterprise Implementation (WBS 2.0)

These are the costs to operate and maintain the Core HR legacy systems. These costs were gathered from the 2000 Data Call that was distributed to each NASA Center and from

discussions with selected HR staff. The tracking of this information is mainly by fund source (FS 41 civil servants, FS 42 civil servant travel, and FS 43 costs paid to contractors or third parties). Due to this tracking, data could not be accurately separated among each of the cost elements included in this analysis. Therefore, Status Quo costs are captured under Center-unique and NACC costs as described below. Exhibit 14 presents the total 10-year costs of the Status Quo alternative in present value (costs are in thousands).

Exhibit 14: 10-Year Present Value Costs (\$000s)

(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
TOTALS	\$ 3,125	\$ 3,044	\$ 2,976	\$ 3,124	\$ 2,835	\$ 2,747	\$ 2,662	\$ 2,579	\$ 2,499	\$ 2,422	\$ 28,014
Total Costs	\$ 3,125	\$ 3,044	\$ 2,976	\$ 3,124	\$ 2,835	\$ 2,747	\$ 2,662	\$ 2,579	\$ 2,499	\$ 2,422	\$ 28,014
Fund Source 41	\$ 42	\$ 40	\$ 39	\$ 38	\$ 37	\$ 36	\$ 34	\$ 33	\$ 32	\$ 31	\$ 362
Fund Source 42	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Fund Source 43	\$ 3,084	\$ 3,004	\$ 2,937	\$ 3,086	\$ 2,798	\$ 2,712	\$ 2,628	\$ 2,546	\$ 2,467	\$ 2,391	\$ 27,652
2.0 Enterprise Implementation	\$ 3,125	\$ 3,044	\$ 2,976	\$ 3,124	\$ 2,835	\$ 2,747	\$ 2,662	\$ 2,579	\$ 2,499	\$ 2,422	\$ 28,014
2.1.5.1 Parallel Operations	\$ 3,125	\$ 3,044	\$ 2,976	\$ 3,124	\$ 2,835	\$ 2,747	\$ 2,662	\$ 2,579	\$ 2,499	\$ 2,422	\$ 28,014
2.1.5.1.1 NACC Costs	\$ 301	\$ 298	\$ 294	\$ 290	\$ 289	\$ 280	\$ 271	\$ 263	\$ 255	\$ 247	\$ 2,788
2.1.5.1.2 Agency-wide System Sustaining Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5.1.2.1 Government	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5.1.2.2 Contractor	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5.1.3 Center Unique Support	\$ 2,824	\$ 2,746	\$ 2,682	\$ 2,834	\$ 2,546	\$ 2,467	\$ 2,391	\$ 2,317	\$ 2,245	\$ 2,175	\$ 25,226
2.1.5.1.3.1 Government	\$ 42	\$ 40	\$ 39	\$ 38	\$ 37	\$ 36	\$ 34	\$ 33	\$ 32	\$ 31	\$ 362
2.1.5.1.3.2 Contractor	\$ 2,782	\$ 2,706	\$ 2,643	\$ 2,796	\$ 2,510	\$ 2,432	\$ 2,356	\$ 2,283	\$ 2,213	\$ 2,144	\$ 24,864
2.1.5.1.4 Business Operations Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5.1.4.1 Government	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5.1.4.2 Contractor	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Total Status Quo Present Value Costs \$28,014,000

Total 10-year life cycle (Discount Rate 3.2%)

4.2.1.1 Parallel System Operations (WBS 2.1.5.1)

Total Present Value Cost: \$28,014,000

For the Status Quo, this is the cost of operating the legacy systems.

4.2.1.1.1 NACC Cost (WBS 2.1.5.1.1)

Total Present Value Cost: \$2,788,000

These are the costs paid by each Center to the NACC for the management of system hardware and software as well as technical support for systems administration, database administration, and other Agency responsibilities.

Exhibit 15: NACC Cost in Present Value

(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
NACC	\$ 301,176	\$ 297,893	\$ 294,219	\$ 290,157	\$ 288,870	\$ 279,913	\$ 271,233	\$ 262,823	\$ 254,674	\$ 246,777	\$ 2,787,735

4.2.1.1.2 Agency-wide System Sustaining Support (WBS 2.1.5.1.2)**Total Present Value Cost: \$0**

These are the civil servant and contractor costs for the Agency-wide systems that support the Core HR functions. Due to the difficulty with allocating support costs between Agency-wide and Center-unique systems, the Agency-wide system sustaining support costs are captured under the Center-unique support (WBS 2.1.5.1.3).

4.2.1.1.3 Center-unique Support (WBS 2.1.5.1.3)**Total Present Value Cost: \$25,226,000**

Due to the difficulty with breaking out costs between Center-unique and Agency-wide systems, software and hardware maintenance of both Agency-wide and Center-unique systems are covered under this cost element. This cost element addresses the costs associated with contract and maintenance labor (both corrective and preventive) for all sites. This refers to costs incurred in providing maintenance and repairs for the system hardware regardless of who has “ownership” of the equipment or responsibility for repair. These costs include, but are not limited to, overhaul expenses, programmed maintenance expenses, component repairs, minor facility modifications and upkeep, equipment repairs, second destination transportation, and administrative support required for maintenance operations.

Software maintenance costs include labor to maintain the software and install upgrades and fixes. This element includes the cost of civil servants to perform software maintenance as well as the fees paid to contractors to perform software maintenance. For the Status Quo alternative, the costs for security maintenance and hardware maintenance and upgrades are also included under this element.

These costs were gathered from Fund Source 43 of the 2000 Data Call. FS 43 costs were divided for each IFM module, but these were not separated for the Core HR module. The FS 43 costs relate to four HR modules (Core HR, Payroll, Resume Management, and Position Description Management). Resume Management and Position Description Management, however, are manual processes and do not involve system maintenance costs. Therefore, the total FS 43 cost were divided between Core HR and Payroll. Since Payroll is a consolidated function at MSFC, the costs at the nine other Centers were divided 10%/90% between Payroll and Core HR respectively. Exhibit 16 presents the FS 43 costs for Core HR.

Exhibit 16: Agency-wide and Center-unique Support Cost in Present Value
(Discount Rate 3.2%)

Agency-wide and Center-uniques	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
ARC	\$ 384,496	\$ 372,574	\$ 361,021	\$ 349,827	\$ 338,979	\$ 328,468	\$ 318,283	\$ 308,414	\$ 298,851	\$ 289,584	\$ 3,350,497
DFRC	\$ 63,760	\$ 63,567	\$ 63,506	\$ 63,388	\$ 63,217	\$ 61,257	\$ 59,357	\$ 57,517	\$ 55,733	\$ 54,005	\$ 605,307
GRC	\$ 359,302	\$ 354,264	\$ 349,375	\$ 344,801	\$ 340,346	\$ 329,793	\$ 319,567	\$ 309,658	\$ 300,056	\$ 290,752	\$ 3,297,914
GSFC	\$ 491,279	\$ 491,069	\$ 489,307	\$ 488,417	\$ 468,830	\$ 454,293	\$ 440,206	\$ 426,556	\$ 413,330	\$ 400,513	\$ 4,563,802
HQ	\$ 26,453	\$ 26,384	\$ 26,385	\$ 263,604	\$ 26,226	\$ 25,413	\$ 24,625	\$ 23,862	\$ 23,122	\$ 22,405	\$ 488,480
JSC	\$ 362,888	\$ 353,983	\$ 345,281	\$ 336,779	\$ 328,472	\$ 318,286	\$ 308,417	\$ 298,854	\$ 289,587	\$ 280,608	\$ 3,223,153
KSC	\$ 62,209	\$ 62,064	\$ 61,960	\$ 61,802	\$ 61,679	\$ 59,767	\$ 57,913	\$ 56,118	\$ 54,378	\$ 52,691	\$ 590,581
LaRC	\$ 115,213	\$ 111,641	\$ 108,179	\$ 104,825	\$ 101,574	\$ 98,425	\$ 95,373	\$ 92,415	\$ 89,550	\$ 86,773	\$ 1,003,967
SSC	\$ 73,062	\$ 53,708	\$ 49,040	\$ 43,993	\$ 42,714	\$ 41,390	\$ 40,106	\$ 38,863	\$ 37,658	\$ 36,490	\$ 457,023
Tech Support	\$ 1,938,663	\$ 1,889,253	\$ 1,854,054	\$ 2,057,436	\$ 1,772,038	\$ 1,717,091	\$ 1,663,848	\$ 1,612,256	\$ 1,562,264	\$ 1,513,821	\$ 17,580,724
Payroll (10%)	\$ 193,866	\$ 188,925	\$ 185,405	\$ 205,744	\$ 177,204	\$ 171,709	\$ 166,385	\$ 161,226	\$ 156,226	\$ 151,382	\$ 1,758,072
Personnel (90%)	\$ 1,744,797	\$ 1,700,328	\$ 1,668,649	\$ 1,851,692	\$ 1,594,834	\$ 1,545,382	\$ 1,497,463	\$ 1,451,030	\$ 1,406,037	\$ 1,362,439	\$ 15,822,652

In addition to the costs at the nine Centers listed above, the costs to support the Core HR systems at MSFC were also included. These costs are presented in Exhibit 17 below.

Exhibit 17: Core HR Costs at Marshall in Present Value*(Discount Rate 3.2%)*

MSFC - Personnel	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Cntr	\$247,093	\$239,431	\$232,007	\$224,813	\$217,842	\$211,087	\$204,542	\$198,200	\$192,055	\$186,101	\$2,153,172

In addition to the costs included in the data call, the costs of the Sustaining Engineering Support for Agency-wide Administrative Systems (SESAAS) contract that supports NPPS, CAPPs, AdminSTAR, and NTDS were also included. These costs are estimated in Exhibit 18.

Exhibit 18: SESAAS Costs for Core HR in Present Value*(Discount Rate 3.2%)*

SESAAS	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
NPPS and CAPPs	\$379,457	\$367,691	\$356,290	\$345,242	\$334,537	\$324,164	\$314,112	\$304,372	\$294,934	\$285,789	\$3,306,590
AdminSTAR	\$394,961	\$382,714	\$370,847	\$359,348	\$348,206	\$337,408	\$326,946	\$316,808	\$306,985	\$297,466	\$3,441,690
NTDS	\$16,085	\$15,587	\$15,103	\$14,635	\$14,181	\$13,741	\$13,315	\$12,902	\$12,502	\$12,115	\$140,167

4.2.1.1.4 Functional Support (WBS 2.1.5.1.4)**Total Present Value Cost: \$0**

These are the costs associated with the functional support staff. The functional support staff duties primarily include administrative or clerical jobs such as reconciliation, producing reports, and monitoring batch jobs. It is assumed that none of the alternatives will result in a cut in NASA functional staff. Therefore, functional FTEs were not included in the cost estimates.

4.3 SAP

The Full COTS alternative is defined as the adoption of SAP R/3 (SAP).

A study was conducted in the spring of 2001 that examined the cost of the Full COTS alternative, specifically, SAP. The cost estimate was a bottom up approach built on level of effort and was developed based on analogous SAP implementations and collaboration with SAP subject matter experts. The findings of the study are documented in this section of the BCA and will be used as the cost estimate for the COTS alternative.

To obtain relevant and Center-specific information regarding the requirements and immediate needs for the Core HR module, NASA functional personnel actively participated in developing this BCA. In addition, data gathered for previous analyses, where still current and relevant, was used. This data was previously collected from an Agency-wide data call, interviews with NASA personnel, and interviews with ERP software vendors and subject matter experts. Interviews with NASA personnel were conducted to gather additional data for this analysis and to verify the accuracy of data previously collected. Exhibit 19 presents the life cycle costs for SAP.

Exhibit 19: SAP Present Value Life Cycle Costs (\$000s)
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
TOTALS	\$ 3,125	\$ 8,331	\$ 22,738	\$ 19,721	\$ 1,299	\$ 1,258	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 61,127
1.0 Program Implementation	\$ -	\$ 5,287	\$ 13,816	\$ 3,110	\$ 1,299	\$ 1,258	\$ -	\$ -	\$ -	\$ -	\$ 24,771
1.1 Program Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2 Integration Project	\$ -	\$ 1,302	\$ 1,383	\$ 1,340	\$ 1,299	\$ 1,258	\$ -	\$ -	\$ -	\$ -	\$ 6,582
1.2.1 Infrastructure Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.2 Module Implementation	\$ -	\$ 973	\$ 79	\$ 77	\$ 74	\$ 72	\$ -	\$ -	\$ -	\$ -	\$ 1,275
1.2.3 Operations and Sustaining Support	\$ -	\$ 330	\$ 1,304	\$ 1,263	\$ 1,224	\$ 1,186	\$ -	\$ -	\$ -	\$ -	\$ 5,307
1.3 Core HR Module Project	\$ -	\$ 3,985	\$ 12,433	\$ 1,770	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 18,189
1.3.1 Project Management	\$ -	\$ 348	\$ 1,350	\$ 654	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,353
1.3.2 Project Formulation	\$ -	\$ 1,878	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,878
1.3.3 Agency Design	\$ -	\$ 1,299	\$ 3,770	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,069
1.3.4 Pilot Center Implementation	\$ -	\$ -	\$ 3,468	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,468
1.3.5 Pilot Center Training	\$ -	\$ 460	\$ 2,932	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,392
1.3.6 Pilot Center Data Conversion	\$ -	\$ -	\$ 338	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 338
1.3.7 Roll Out	\$ -	\$ -	\$ 576	\$ 1,116	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,692
1.3.8 Technical Refreshment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.0 Enterprise Implementation	\$ 3,125	\$ 3,044	\$ 8,922	\$ 16,611	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 36,357
2.1 Core HR Module Project	\$ 3,125	\$ 3,044	\$ 8,922	\$ 16,611	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 36,357
2.1.1 Project Management	\$ -	\$ -	\$ 333	\$ 1,291	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,625
2.1.2 Center Implementation	\$ -	\$ -	\$ 625	\$ 3,901	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,526
2.1.3 Center Data Conversion	\$ -	\$ -	\$ 250	\$ 1,291	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,541
2.1.4 Center Training Delivery	\$ -	\$ -	\$ 4,738	\$ 8,566	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 13,303
2.1.5 Operations and Sustaining Support	\$ 3,125	\$ 3,044	\$ 2,976	\$ 1,562	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 15,362

Total SAP Present Value Costs \$61,127,000
Total 10-year Life Cycle (Discount Rate 3.2%)

4.3.1 Program Implementation (WBS 1.0)

Program implementation costs are the costs incurred by the IFM program office. These include the costs to develop and design the system, to acquire the hardware and software, and to run the Pilot. **The total present value Program Implementation Costs are \$24,771,000.**

4.3.1.1 Program Management (WBS 1.1)

Total Present Value Cost: \$0

The Program Management costs represent the IFM Program oversight and management support. Since these costs support all 12 Modules, they have not been allocated to any specific system and are not included in this analysis. However, the Project Management costs to directly support the implementation of the Core HR Module are included in this BCA under WBS 1.3.1.

4.3.1.2 Integration Project (WBS 1.2)

Total Present Value Cost: \$6,582,000

The Integration Project costs include Infrastructure Support, Module Implementation, and Operations and Sustaining Support costs. The Infrastructure Support and Module Implementation costs cover the overall design of the IFMP architecture as well as the costs associated with the NACC for all 12 Modules. The hardware costs are included under the Module Implementation and the costs to operate and sustain the new system for two-plus fiscal years after the completion of the Center Rollout are included under the Operations and Sustaining Support heading. (For more detail on the length of time the Program will be

responsible for the operations and sustaining support costs, refer to the global cost assumptions at the beginning of this section.)

4.3.1.2.1 Infrastructure Support (WBS 1.2.1)
Total Present Value Cost: \$0

There are no Infrastructure Support costs for the Core HR Module.

4.3.1.2.2 Core HR Module Implementation (WBS 1.2.2)
Total Present Value Cost: \$ 1,275,000

The Module Implementation Section includes the costs for hardware and hardware upgrades. These costs were provided by the Integration Project.

This cost is derived from the Integration Project's estimate of additional capacity and resources required to operate the Core HR functionality on top of the Core Finance Module. The estimate is based on the additional memory and CPUs the two Sun E10K servers, at 50% capacity, would require to sustain the additional workloads of HR.

4.3.1.2.3 Operations and Sustaining Support (WBS 1.2.3)
Total Present Value Cost: \$ 5,307,000

These costs are associated with maintaining the application, once implemented, through the life cycle of the system. The Operations and Sustaining Support (O&S) costs are significantly reduced from the current operating environment due to the consolidation of operations. Instead of maintaining hardware and software at ten separate Centers, this technology is maintained at one location. As a result, NASA will experience savings resulting from economies of scale and increased efficiency.

The Program will incur these O&S costs for two full fiscal years following the Implementation of the solution, in addition to the remainder of the fiscal year following Rollout.¹⁰ The SAP alternative will be fully implemented after the second quarter of FY05. Therefore, the Program will fund the O&S until the end of FY07. Beginning in FY08 the Enterprises will be responsible for these O&S costs.

In addition, the Program will fund the Program Management and Integration costs throughout the system's life cycle (FY02–FY11). The O&S costs are divided between Program-wide support and Module support as described below.

The cost estimate is based on the additional resources required to operate the Core HR functionality on top of the Core Financial system. This cost is based on the scope of Core HR functionality and is derived as a percentage of Core Finance's operations and sustaining support costs. The elements that make up the estimate are as follows: Application Functional Support, Application Development Support, and Application Operations Support.

¹⁰ Recurring training and Business Process Support will be funded by the Enterprises for the entire O&S stage (from FY05 – FY11).

— **Labor Cost:**

Total Present Value Cost: \$5,307,000

- **Application Functional Support**

This entails items such as Tier 2 help desk support, "How-To" support, and table configuration. The support staff is often referred to as "functechs" who possess functional specific (e.g., Core HR) knowledge of the system.

- **Application Development Support**

This entails support staff who are ABAP programmers who can develop extensions to the core SAP software and bolt-ons. This also includes Enterprise Application Integration (EAI) experts with programming skills who can maintain interfaces between multiple systems such as SAP and Legacy systems. This can also include staff with Business Warehousing (BW) expertise.

- **Application Operations Support**

This is composed of technical experts with profound technical expertise of SAP. The skills would include BASIS administration, database administration, operating systems administration, configuration management, and transport control to name a few.

4.3.1.3 Core HR Module Project (WBS 1.3)

Total Present Value Cost: \$18,189,000

The Core HR Module Project costs represent the costs incurred by the IFM Program during the Implementation of the Core HR system. The Program Office will cover the costs during the Formulation, Agency Design, and Pilot Phases. The Program will also support the Agency-wide Rollout by a team of civil servants and contractors.

4.3.1.3.1 Project Management (WBS 1.3.1)

Total Present Value Cost: \$ 2,353,000

These are the costs to manage the design and implementation of the module. These costs do not include the IFMP oversight costs.¹¹ Included are costs for technical and administrative planning, organization, direction, coordination and control, and approval actions designed to define and accomplish overall information management objectives. Also, includes contract acquisition, contractor management, project control, concept development, quality assurance, project planning, acquisition management, and data management costs.

This entails a government project manager (civil servant) overseeing the module project from its Formulation to the final Rollout of the module at the remaining Centers. The government project manager will be fully dedicated to the project at 100% effort for the 21-month duration of the project. There will be three contractors dedicated to project management activities mentioned above for the 21-month duration of the project. The level of effort is shown in detail in Exhibit 20. The cost for this element is captured in WBS 1.3.1.

¹¹ The Program Management costs represent the IFM Program oversight and management support. Since these costs support all 12 Modules, they have not been allocated to any specific system and are not included in this analysis.

Exhibit 20: Core HR Project Management Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Project Management	0.0	0.0	0.2	0.9	0.6	3.4	0.3	1.7
Number of People	0	0	1	3	1	3	1	3
Number of Months	0.0	0.0	3.0	3.0	12.0	12.0	6.0	6.0
Percent of Time	100%	100%	100%	100%	100%	100%	100%	100%

- **Government (WBS 1.3.1.1)**
Total Present Value Cost: \$96,000
- **Contractor (WBS 1.3.1.2)**
Total Present Value Cost: \$1,962,000
- **Travel & Expenses (WBS 1.3.1.3)**
Total Present Value Cost: \$294,000

4.3.1.3.2 Core HR Module Formulation (WBS 1.3.2)
Total Present Value Cost: \$1,878,000

The Formulation phase will occur before Agency Design. The Formulation phase involves developing a risk management plan and procedures, developing Program Commitment Agreement (PCA) addendum documents, establishing the baseline for the Agency Design phase, identifying requirements for the Core HR module, and conducting a gap analysis. This cost was provided by the IFM Program Office.

4.3.1.3.3 Agency Design (WBS 1.3.3)
Total Present Value Cost: \$5,069,000

The Agency Design costs are the costs incurred during the 6.5 month Agency Design phase beginning in the fourth quarter of FY03. During this phase, the standard Agency-wide integrated solution will be developed. This solution will reflect reengineered changes and operate within the capabilities of SAP. The key tasks included in the Agency Design phase are:

- Identifying and resolving gaps between the NASA processes and requirements and the SAP software
- Aligning NASA's business processes with SAP through process reengineering
- Configuring and testing the software
- Identifying, developing, and testing Agency interfaces, reporting capabilities, extensions and bolt-ons, and security and control profiles
- Developing Agency training and user procedure templates that are aligned with the Agency design solution
- Developing an Agency data conversion strategy
- Defining a detailed technical architecture
- Preparing to transition to the Pilot Center Implementation phase.

The cost of the Agency Design is broken into the following WBS sub-elements:

- Requirements Analysis/BPR/CM (WBS 1.3.3.1)
- Configuration Management (WBS 1.3.3.2)
- Bolt-ons/Extensions/Interface Design (WBS 1.3.3.3)
- Security (WBS 1.3.3.4)

- Testing (WBS 1.3.3.5)
- Establish Data Conversion Framework (WBS 1.3.3.6)
- Travel & Expenses (WBS 1.3.3.7)

- **Requirements Analysis/BPR/CM (WBS 1.3.3.1)**
Total Present Value Cost: \$1,175,000

These are the costs incurred to complete the development of the requirements, to obtain input from the necessary stakeholders, to begin business process reengineering activities, and to conduct change management to facilitate the transition to the new system. Includes the costs to identify, define, and establish functional and technical requirements during the development phase. This includes, but is not limited to, business process reengineering (BPR), change management activities, creating technical requirements documentation, and reviewing current system requirements and NASA IT standards.

There will be three civil servants at 50% effort engaged in these activities during 4.5 months of the Agency Design phase. There will also be 18 contractor personnel at 50% time engaged in these activities for 4.5 months of the Agency Design phase. Exhibit 21 shows the level of effort for this task. The cost for this element is captured in WBS 1.3.3.1.

Exhibit 21: Agency Design Requirements Analysis/BPR/CM Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Requirements Analysis/BPR/CM	0.0	0.0	0.2	1.1	0.4	2.2	0.0	0.0
Number of People	0	0	3	18	3	18	0	0
Number of Months	0.0	0.0	1.5	1.5	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	50%	50%	50%	50%	0%	0%

- **Configuration Management (WBS 1.3.3.2)**
Total Present Value Cost: \$1,125,000

The staff identified under this activity will perform the Configuration Management functions. Configuring the system begins with designing the Agency-wide software solution, which includes gathering input from appropriate stakeholders. The Project Manager will be responsible for approving detailed configuration and implementation changes identified during this period.

Exhibit 22 shows the level of effort for this task. There will be two civil servants and 13 contractor personnel engaged in Configuration Management activities allocated at 50% time for the three-month period. The cost for this element is captured in WBS 1.3.3.2.

Exhibit 22: Agency Design Configuration Management Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Configuration Management	0.0	0.0	0.3	1.6	0.3	1.6	0.0	0.0
Number of People	0	0	2	13	2	13	0	0
Number of Months	0.0	0.0	3.0	3.0	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	50%	50%	50%	50%	0%	0%

- **Bolt-ons/Extensions/Interface Design (WBS 1.3.3.3)**
Total Present Value Cost: \$593,000

Although the overall Program objective is to minimize software modifications, extensions, and bolt-ons, critical business requirements may dictate their development. The staff identified under this activity will determine whether there is a need for a modification, an extension, or a bolt-on to resolve functionality gaps with the selected software. Critical gaps are evaluated, alternative solutions are proposed, and a recommendation is provided. The alternatives are evaluated for pros and cons, impact to business processes as well as impact on Project cost and schedule.

There will be one civil servant and five contractor personnel allocated at 50% time for the first month, and fully dedicated at 100% time in the subsequent 3.5 months for the development of bolt-ons, extensions, and interfaces during the Agency Design phase of the project. Exhibit 23 shows the level of effort associated with this task, and the cost is captured in WBS 1.3.3.3.

Exhibit 23: Agency Design Bolt-on/Extension/Interface Design Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Bolt-on/Extension/Interface Design	0.0	0.0	0.0	0.2	0.3	1.5	0.0	0.0
Number of People	0	0	1	5	1	5	0	0
Number of Months	0.0	0.0	1.0	1.0	3.5	3.5	0.0	0.0
Percent of Time	0%	0%	50%	50%	100%	100%	0%	0%

- **Security (WBS 1.3.3.4)**
Total Present Value Cost: \$248,000

The staff identified under this activity will develop security user groups and the separation of duty control rules that govern user access to the integrated business functions and data. These conventions will define security profiles based on roles and responsibilities. These profiles will define groups of users who have the privilege to retrieve, create, update, or delete data. Exhibit 24 captures the level of effort for system security during the Agency Design phase.

Exhibit 24: Agency Design Security Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Security	0.0	0.0	0.0	0.2	0.1	0.5	0.0	0.0
Number of People	0	0	2	9	2	9	0	0
Number of Months	0.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0
Percent of Time	0%	0%	25%	25%	75%	75%	0%	0%

There will be two civil servants and nine contractor personnel engaged in this activity during a two-month period. The personnel will be allocated at 25% time in the first month, and 75% time in the second month. The cost for this element is captured in WBS 1.3.3.4.

- **Testing (WBS 1.3.3.5)**
Total Present Value Cost: \$443,000

Includes the costs incurred to obtain or validate relevant data on the performance of the module during the development period. This element includes the detailed planning, conduct, and support of such testing, as well as reporting. It also includes all costs associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Exhibit 25 shows the Agency Design testing level of effort.

Exhibit 25: Agency Design Testing Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Testing	0.0	0.0	0.0	0.0	0.2	1.3	0.0	0.0
Number of People	0	0	0	0	1	5	0	0
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	0%	0%	100%	100%	0%	0%

This cost is captured under the WBS element 1.3.3.5. There will be one civil servant and five contractor personnel devoted to testing activities during the Agency Design phase of the module project. The staff will be fully dedicated at 100% time to testing for the three-month duration.

- **Establish Data Conversion Framework (WBS 1.3.3.6)**
Total Present Value Cost: \$775,000

The staff identified under this activity will develop guidelines and specifications for data conversion. These specifications define the type of data to be converted, how the data will be converted, what data will be archived, the business rules for converting the data, and how the data will be cleaned up prior to conversion. Specific transition data structures are identified to support the specifications. The cost for this element is captured under WBS 1.3.3.6, and the level of effort is shown in detail in Exhibit 26.

Exhibit 26: Agency Design Establishing Data Conversion Framework Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Establish Data Conversion Framework	0.0	0.0	0.0	0.0	0.4	2.2	0.0	0.0
Number of People	0	0	0	0	3	18	0	0
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	0%	0%	50%	50%	0%	0%

Establishing the Data Conversion Framework will cover a three-month duration. During which time there will be three civil servants and 18 contractor personnel engaging in this activity at a 50% effort.

- **Travel & Expenses (WBS 1.3.3.7)**
Total Present Value Cost: \$709,000

The civil servant travel and expenses are calculated based on the following assumptions:

Exhibit 27: Agency Design Civil Servants Travel Cost Assumptions

Flight transportation per individual per trip	\$ 800
Travel Cost Per Day - Per diem	\$ 150
Number of days per trip	5
Average cost per person per trip	\$ 1550

Exhibit 28 shows the civil servant travel cost during the Agency Design phase. Ten people will take two trips during year two of the module project, and these ten people will take four trips during year three of the project.

Exhibit 28: Agency Design Civil Servant Travel Cost (Constant Year)

Reason for Travel	Year of Travel	Number of People	Number of Trips	Total Cost
Agency Design	2	10	2	\$ 31,000
	3	10	4	\$ 62,000

The contractor travel and expenses are estimated at 15% of the total contractor cost for the Agency Design phase. Travel and expenses are captured under WBS 1.3.3.7. (Note: the cost in Exhibit 28 is presented in constant year dollars, however, the total cost shown under the Travel and Expenses heading is presented in present value dollars.)

- **4.3.1.3.4 Pilot Center Implementation (WBS 1.3.4)**
Total Present Value Cost: \$3,468,000

Pilot Center Implementation includes the costs incurred during the Pilot phase. This phase will take place during the second and third quarters of FY04.

The cost of the Pilot Center Implementation is broken into the following WBS sub-elements:

- Requirements Analysis/BPR/CM (WBS 1.3.4.1)
- Configuration Management (WBS 1.3.4.2)
- Specific Center Modifications (WBS 1.3.4.3)
- Testing (WBS 1.3.4.4)
- Security (WBS 1.3.4.5)
- Travel & Expenses (WBS 1.3.4.6)

- **Requirements Analysis/BPR/CM (WBS 1.3.4.1)**
Total Present Value Cost: \$812,000

The staff identified under this activity will perform similar functions as defined under the corresponding element in Agency Design. During the Pilot Phase, the implementation contractor will work with the Pilot Center Project Team to validate the user requirements and to identify differences between the Agency software solution and the Pilot Center's existing systems, processes and requirements. Business process reengineering will be conducted to follow the best practices incorporated into the SAP software. Additionally, change

management activities will be conducted throughout the Pilot phase. Exhibit 29 shows the level of effort in detail.

Exhibit 29: Pilot Center Requirements Analysis/BPR/CM Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Requirements Analysis/BPR/CM	0.0	0.0	0.0	0.0	0.4	2.3	0.0	0.0
Number of People	0	0	0	0	1	5	0	0
Number of Months	0.0	0.0	0.0	0.0	5.5	5.5	0.0	0.0
Percent of Time	0%	0%	0%	0%	100%	100%	0%	0%

There will be one civil servant and five contractor personnel engaged in Requirements Analysis/BPR/CM at 100% effort during the entire length of the Pilot Center Implementation phase. The cost for the element is captured under WBS 1.3.4.1.

- **Configuration Management (WBS 1.3.4.2)**
Total Present Value Cost: \$452,000

The staff identified under this activity will perform the Configuration Management functions at the Pilot site. The Core HR functionality of the SAP system will then be activated through the configuration process. The Project Manager will be responsible for approving detailed configuration and implementation changes identified during this period. Exhibit 30 shows the Pilot Center Configuration Management level of efforts in detail.

Exhibit 30: Pilot Center Configuration Management Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Configuration Management	0.0	0.0	0.0	0.0	0.2	1.3	0.0	0.0
Number of People	0	0	0	0	1	6	0	0
Number of Months	0.0	0.0	0.0	0.0	3.5	3.5	0.0	0.0
Percent of Time	0%	0%	0%	0%	75%	75%	0%	0%

One civil servant and six contractor staff will engage in this activity at 75% effort during a 3.5-month period. The cost for this element is capture under WBS 1.3.4.2.

- **Specific Center Modifications (WBS 1.3.4.3)**
Total Present Value Cost: \$222,000

This staff will develop linkages between SAP and the Pilot Center's legacy systems. This linkage is automated via software programs or procedural methods and is achieved by using a set of Pilot Center-developed programs that systematically link the Pilot Center legacy systems to the selected software interface programs. The interface activities include analyzing Agency interface requirements, taking inventory of current systems, and providing information about which legacy systems are to remain from an interface perspective. The system inventory activity includes an analysis of functionality, determination of whether or not the functionality is outside the selected software scope, and identification of the legacy systems that will be retained from a functionality perspective. Interface Definition Agreements (IDA's) are developed, and the interfaces are designed and developed. Exhibit 31 shows in detail the level of effort associated with this task.

Exhibit 31: Pilot Center Specific Modifications Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Specific Center Modifications	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.0
Number of People	0	0	0	0	1	5	0	0
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	0%	0%	50%	50%	0%	0%

The cost for this element is captured in WBS 1.3.4.3. There will be one civil servant and five contractor personnel engaged in this activity at 50% effort for a three-month duration during the Pilot Center Implementation phase.

- **Testing (WBS 1.3.4.4)**
Total Present Value Cost: \$849,000

The staff identified under this activity will verify and validate the Pilot Center configuration, Pilot Center data conversion, and Pilot Center interfaces to ensure compliance with functional and data requirements. Testing includes critical path functional processes executed in an integrated environment. The Pilot Center stress testing verifies and validates that hardware and software performances meet the agreed upon standards. Exhibit 32 shows the Pilot Center testing level of effort in detail.

Exhibit 32: Pilot Center Testing Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Testing	0.0	0.0	0.0	0.0	0.4	2.4	0.0	0.0
Number of People	0	0	0	0	3	20	0	0
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
Percent of Time	0%	0%	0%	0%	50%	50%	0%	0%

The element entails three civil servants and 20 contractor personnel at 50% effort for a three-month duration. The cost for this element is captured in WBS 1.3.4.4.

- **Security (WBS 1.3.4.5)**
Total Present Value Cost: \$677,000

This staff will implement the list of role-based security specifications developed in the Agency Design phase and establish user profiles at the Pilot site. The Pilot Center will be aligned with new processes and user roles. The detailed level of effort for this element is shown in Exhibit 33.

Exhibit 33: Pilot Center Security Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Security	0.0	0.0	0.0	0.0	0.3	1.9	0.0	0.0
Number of People	0	0	0	0	2	9	0	0
Number of Months	0.0	0.0	0.0	0.0	5.5	5.5	0.0	0.0
Percent of Time	0%	0%	0%	0%	50%	50%	0%	0%

The development of the Pilot Center security involves two civil servants at 50% effort for a 5.5-month duration during the Pilot Center Implementation phase. There will also be nine

contractors working at 50% effort for the 5.5-month duration. The cost for the element is captured in WBS 1.3.4.5.

- **Travel & Expenses (WBS 1.3.4.6)**
Total Present Value Cost: \$456,000

The civil servant travel and expenses are calculated based on the following assumptions:

Exhibit 34: Pilot Center Rollout Civil Servants Travel Cost Assumptions

Flight transportation per individual per trip	\$ 800
Travel Cost Per Day – Per diem	\$ 150
Number of days per trip	5
Average cost per person per trip	\$ 1550

Exhibit 35 shows the civil servants travel cost during the Pilot phase.

Exhibit 35: Pilot Center Travel Cost (Constant Year)

Reason for Travel	Year of Travel	Number of People	Number of Trips	Total Cost
Pilot	3	3	4	\$ 18,600
	3	3	2	\$ 9,300

There will be three civil servants taking four trips in year three during the Pilot phase of the project. It is also assumed that there will be additional travel needs during the Pilot phase of three civil servant functional experts traveling twice to the Pilot site for consultation during year three. This staff may be from outside of the project management team for the module project and may be from any of the nine other NASA Centers.

The contractor travel and expenses are estimated at 15% of the total contractor cost for the Pilot Center Implementation phase. This cost is captured under WBS 1.3.4.6. (Note: the cost in Exhibit 35 is presented in constant year dollars, however, the total cost shown under the Travel and Expenses heading is presented in present value dollars.)

- **4.3.1.3.5 Pilot Center Training (WBS 1.3.5)**
Total Present Value Cost: \$3,392,000

The Pilot Center Training costs are the costs to develop the Pilot Center training plan, materials, and procedures. This element also includes the delivery of the training to the Pilot site.

- **Development (WBS 1.3.5.1)**
Total Present Value Cost: \$1,119,000

The costs identified under this activity will be used to develop distinct training modules for the functional, casual, technical, and intermittent users. If a user falls under more than one category (e.g., functional and intermittent), the user will receive both types of training. A computer-based training module will also be developed. These costs are shown in Exhibit 36.

Exhibit 36: Pilot Center Training Development Cost (Constant Year)

Type of Training	Functional Years	Casual Years	Technical Years	Intermittent Years	CBT Years	TOTAL
Development - Pilot	2 & 3	2 & 3	2 & 3	2 & 3	2 & 3	
Cost per day to Develop	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000		
Number of Courses times Days	30	10	10	1		
Total Development Cost	\$ 600,000	\$ 200,000	\$ 200,000	\$ 20,000	\$500,000	\$ 1,520,000
% Developed during Pilot						80%
Pilot Development Cost						\$ 1,216,000

It is estimated that 80% of the training will be developed during the Pilot phase, with the remaining 20% of training to be developed during the Center Implementation phase. It is estimated that each day of training costs \$20,000 to develop and the number of days per course depends on the training module. The functional training development is for ten separate three-day courses. The technical training development is for five courses of two days each. The casual user training development is for two courses of five days each. Lastly, the intermittent training development is for a single, one-day course. (Note: the cost in Exhibit 36 is presented in constant year dollars, however, the total cost shown under the Development heading is presented in present value dollars.)

- **Training Delivery (WBS 1.3.5.2)**
Total Present Value Cost: \$2,040,000

This element includes the contractor labor costs to deliver the training and the time the participants spend in training. These costs represent the costs associated with training the Pilot Center users.

- **Contractor Trainer Cost (WBS 1.3.5.2.1)**
Total Present Value Cost: \$433,000

Exhibit 37 shows the detailed cost of the contractor cost for training delivery.

Exhibit 37: Pilot Center Contractor Training Delivery Cost (Constant Year)

Type of Training	Functional Year 3	Casual Year 3	Technical Year 3	Intermittent Year 3	CBT	TOTAL
Delivery - Pilot	Year 3	Year 3	Year 3	Year 3		
Students per class	25	50	25	50		
Number of classes	2	6	1	40		
Number of Trainers per class	2	2	2	2		
Total Trainer hours per class	240	80	80	8		
Trainer Hourly Rate	\$ 175	\$ 175	\$ 175	\$ 175		
Total Trainer Cost	\$ 168,000	\$ 168,000	\$ 28,000	\$ 112,000		\$ 476,000

The contractor rate is assumed to be \$175 per hour, and the hours are based on the number of required classes. (Note: the cost in Exhibit 37 is presented in constant year dollars, however, the cost shown under the Contractor Trainer Cost heading is presented in present value dollars.)

- **Government Participants' Time (WBS 1.3.5.2.1)**
Total Present Value Cost: \$1,348,000

The cost shown in Exhibit 38 shows the cost for the government participants' time in training.

Exhibit 38: Pilot Center Training Government Participant Time Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Delivery - Pilot	Year 3	Year 3	Year 3	Year 3		
Number of Participants	50	300	20	2,000		
Number of Days of Training	10	4	5	1		
Daily Rate	\$ 390	\$ 390	\$ 390	\$ 390		
Participant Time Cost	\$ 194,939	\$ 467,854	\$ 38,988	\$ 779,757		\$ 1,481,538

The daily rate for the government participants is \$390 per day, as stated in the Global Cost Assumptions, Section 4.1. The duration of training is dependent upon the course module, as described under the training Development section. Each type of training is assumed to be independent of the other courses, so system users may receive training in more than one training category. (Note: the cost in Exhibit 38 is presented in constant year dollars, however, the cost shown under the Government Participants' Time heading is presented in present value dollars.)

— **Materials (WBS 1.3.5.2.3)**
Total Present Value Cost: \$259,000

Exhibit 39 shows the cost for training materials. Material costs are based on the material cost per day of training, times the number of total course days, times the number of users within each category of training. System users will receive the full set of course materials for each category of training they take, for reference, even if they do not take all courses within the training category. (Note: the cost in Exhibit 39 is presented in constant year dollars, however, the cost shown under the Materials heading is presented in present value dollars.)

Exhibit 39: Pilot Center Training Materials Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Materials - Pilot	Year 3	Year 3	Year 3	Year 3		
Material Cost per Day of Training	\$ 50	\$ 50	\$ 50	\$ 25		
Number of Courses times Days	30	10	10	1		
Material Cost per User	\$ 1,500	\$ 500	\$ 500	\$ 25		
Number of Users	50	300	20	2,000		
Total Material Cost	\$ 75,000	\$ 150,000	\$ 10,000	\$ 50,000		\$ 285,000

4.3.1.3.6 Pilot Center Data Conversion (WBS 1.3.6)
Total Present Value Cost: \$ 338,000

Pilot Center Data Conversion costs are the costs to convert the necessary data at the Pilot site and any other data needed to effectively run the Pilot. This includes preparing the legacy data, developing the data conversion process, and performing the data conversion. Exhibit 40 shows the Pilot Center data conversion level of effort in detail.

Exhibit 40: Pilot Center Data Conversion Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Pilot Center Data Conversion	0.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0
Number of People	0	0	0	0	1	5	0	0
Number of Months	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0
Percent of Time	0%	0%	0%	0%	50%	50%	0%	0%

Included in this element will be one civil servant at 50% effort for a four-month duration. There will also be five contractors at 50% effort for four months engaging in this task. The cost for this element is captured under WBS 1.3.6.

- **Government (WBS 1.3.6.1)**
Total Present Value Cost: \$14,000
- **Contractor (WBS 1.3.6.2)**
Total Present Value Cost: \$282,000
- **Travel & Expenses (WBS 1.3.6.3)**
Total Present Value Cost: \$42,000

The contractor travel and expenses are estimated at 15% of the total contractor cost for the Pilot Center Data Conversion phase. This cost is captured under WBS 1.3.6.3.

4.3.1.3.7 Rollout (WBS 1.3.7)
Total Present Value Cost: \$ 1,692,000

The Rollout costs incurred by the Program Office are the costs of the Agency-wide team that will support the rollout teams at each of the Centers. This Agency-wide team will interface with Program Management (IFMP) and will oversee the entire Rollout. This element includes labor and travel costs. The level of effort for the rollout support at the remaining Centers is shown in detail in Exhibit 41.

Exhibit 41: Agency Rollout Support Level of Effort

Core HR	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Rollout to Remaining Centers	0.0	0.0	0.0	0.0	1.2	1.0	2.5	2.0
Number of People	0	0	0	0	5	4	5	4
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	6.0	6.0
Percent of Time	0%	0%	0%	0%	100%	100%	100%	100%

Five civil servants and four contractors will assist with the Rollout at the remaining Centers at 100% effort for three months in year three. Approximately five civil servants and four contractors will assist with the Rollout out for six months at 100% effort in year four. The cost for the civil servants is captured under WBS 1.3.7.1, and the cost for contractors for this element is captured under WBS 1.3.7.2. The travel and expenses incurred during this phase are captured under WBS 1.3.7.3.

- **Government (WBS 1.3.7.1)**
Total Present Value Cost: \$335,000
- **Contractor (WBS 1.3.7.2)**
Total Present Value Cost: \$985,000

- **Travel & Expenses (WBS 1.3.7.3)**
Total Present Value Cost: \$372,000

The civil servant travel and expenses are calculated based on the following assumptions:

Exhibit 42: Pilot Center Rollout Civil Servants Travel Cost Assumptions

Flight transportation per individual per trip	\$ 800
Travel Cost Per Day - Per diem	\$ 150
Number of days per trip	5
Average cost per person per trip	\$ 1550

Exhibit 43 shows the civil servants travel cost during the Agency Rollout phase.

Exhibit 43: Agency Rollout Support Travel Cost (Constant Year)

Reason for Travel	Year of Travel	Number of People	Number of Trips	Total Cost
Rollout to Remaining Centers	3	9	6	\$ 83,700
	4	9	12	\$ 167,400

In year three of the module project, nine civil servants (one representing each Center) will take six trips (two trips to each of the three Centers being rolled out in year three). In year four of the module project, these same nine civil servants will take twelve trips (two trips to each of the six Centers being rolled out in year four). (Note: the cost in Exhibit 43 is presented in constant year dollars, however, the cost under the Rollout and Travel and Expenses headings are presented in present value dollars.)

The contractor travel and expenses are estimated at 15% of the total contractor cost for Project Management during Rollout. The civil servant and contractor travel and expenses are both captured under WBS 1.3.7.3.

4.3.1.3.8 Technical Refreshment (WBS 1.3.8) **Total Present Value Cost: \$ 0**

These costs are not allocated to individual module projects and are outside the scope of this BCA.

4.3.2 Enterprise Implementation (WBS 2.0)

Enterprise Implementation costs are the costs incurred by the NASA Centers (with the exception of the Pilot Center). These are the costs associated with rolling out the new system to the remaining nine Centers. **The total present value Program Implementation Costs are \$36,357,000.**

4.3.2.1 Core Human Resources Module Project (WBS 2.1)

The Core HR Module Project costs under the Enterprise Implementation presents the costs covered by the Enterprises to roll out the Core HR system. The implementation costs for the Enterprises are covered under WBS elements 2.1.1 through 2.1.4. These elements represent the

Enterprise costs for the Agency-wide Rollout. The Agency Rollout will migrate the new production environment to the Centers using the Pilot Center's Implementation Model as a template. These costs are incurred during the 12-month rollout phase from October 2002 to September 2003.

In addition to the implementation costs, WBS 2.1.5 covers the O&S costs incurred by the Enterprises.

4.3.2.1.1 Project Management (WBS 2.1.1)

Total Present Value Cost: \$ 1,625,000

The Project Management costs associated with the Enterprise Implementation include the costs of each Center to manage the Rollout and Implementation of the new system at its site. The level of effort is shown in detail in Exhibit 44.

Exhibit 44: Center Rollout Project Management Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Center Project Management	0	0	0.0	0.0	0.8	0.7	3.3	2.7
Number of People	0	0	0	0	3	3	7	5
Number of Months	0.0	0.0	0.0	0.0	3.0	3.0	6.0	6.0
Percent of Time	0%	0%	0%	0%	100%	100%	100%	100%

This entails a government project manager at each Center (civil servant) overseeing the Rollout of the module project. The three government project manager will be fully dedicated to the project at 100% effort for the three months of Rollout at three Centers in year three. In year four, there will be seven civil servants project managers overseeing the Rollout at the remaining six Centers for six months at 100% effort. There will be three contractors dedicated to project management activities mentioned above for the three-month duration of the project in year three, and five contractors will be present in year four for six months at 100% effort. The cost for this element is captured in WBS 2.1.1.1 for civil servants and WBS 2.1.1.2 for contractors.

- **Government (WBS 2.1.1.1)**
Total Present Value Cost: \$371,000
- **Contractor (WBS 2.1.1.2)**
Total Present Value Cost: \$1,090,000
- **Travel & Expenses (WBS 2.1.1.3)**
Total Present Value Cost: \$164,000

The contractor travel and expenses are estimated at 15% of the total contractor cost for the Enterprise Implementation Project Management phase. This cost is captured under WBS 2.1.1.3. With the exception of the Rollout support captured under section 4.3.1.3.7 (WBS 1.3.7), all civil servants are assumed to be located at their home Centers during Rollout. Therefore, there are no civil servant travel costs (besides the ones captured under section 4.3.1.3.7) associated with Rollout.

4.3.2.1.2 Center Implementation (WBS 2.1.2)

Total Present Value Cost: \$ 4,526,000

The Center Rollout involves implementing the Agency-wide solution at each of the remaining nine Centers.

- **BPR/Change Management (WBS 2.1.2.1)**
Total Present Value Cost: \$983,000

The Center business process reengineering (BPR) follows the BPR conducted during the Agency Design and Pilot phases. Locally enhanced functionality will be accepted, business process changes to the application will not. Change Management will be conducted to facilitate the transition to the new system. The detailed level of effort is shown in Exhibit 45.

Exhibit 45: Center Rollout BPR/Change Management Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
BPR/Change Management	0.0	0.0	0.0	0.0	0.3	0.3	2.5	2.0
Number of People	0	0	0	0	5	4	10	8
Number of Months	0.0	0.0	0.0	0.0	1.0	1.0	6.0	6.0
Percent of Time	0%	0%	0%	0%	75%	75%	50%	50%

This element involves five civil servants for one month at 75% effort during the Rollout phase in year three. There will be ten civil servants in year four at 50% effort for six months supporting this task. Four contractors will be participating in the task in year three for one month at 75% effort. In year four, eight contractors will be engaged in the task for six months at 50% effort. The cost for the element is captured under WBS 2.1.2.1.

- **Configuration Management (WBS 2.1.2.2)**
Total Present Value Cost: \$656,000

The Center configuration follows the configuration developed during the Agency Design and Pilot phases. During the Center Rollout phase, the implementation contractor will work with the Center Project Team to validate the user requirements and to identify differences between the Agency software solution and the Center's existing systems, processes and requirements. The detailed level of effort this task is shown in Exhibit 46.

Exhibit 46: Center Rollout Configuration Management Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Configuration Management	0.0	0.0	0.0	0.0	0.2	0.2	1.7	1.4
Number of People	0	0	0	0	3	3	7	5
Number of Months	0.0	0.0	0.0	0.0	1.0	1.0	4.0	4.0
Percent of Time	0%	0%	0%	0%	75%	75%	75%	75%

There will be three civil servants and three contractor personnel engaged in the task in year three for one month at 75% effort. There will be seven civil servants and five contractors performing configuration management in year four for four months at 75% effort. The cost for this element is captured under WBS 2.1.2.2.

- **Specific Center Modifications (WBS 2.1.2.3)**

Total Present Value Cost: \$753,000

The Center Interfaces are a linkage between the selected software and Center legacy systems. This linkage is automated via software programs or procedural methods. This linkage is achieved by using a set of Center-developed programs that systematically link the Center legacy systems to the selected software interface programs. An interface may be either permanent or temporary.

Center Project Team interface activities include analyzing Agency interface requirements, taking inventory of current systems, and providing information about which legacy systems to retain from an interface perspective. The system inventory includes an analysis of functionality, a determination of whether or not the functionality is outside the selected software scope, and identification of the legacy systems that will be retained from a functionality perspective. The detailed level of effort is shown in Exhibit 47.

Exhibit 47: Center Rollout Specific Center Modifications Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Specific Center Modifications	0.0	0.0	0.0	0.0	0.3	0.2	1.9	1.5
Number of People	0	0	0	0	3	3	7	5
Number of Months	0.0	0.0	0.0	0.0	2.0	2.0	4.5	4.5
Percent of Time	0%	0%	0%	0%	50%	50%	75%	75%

The cost for this element is captured under WBS 2.1.2.3. The element contains three civil servants and three contractors at 50% effort for two months in year three. Year four contains seven civil servants and five contractors for 4.5 months at 75% effort.

- **Center Testing (WBS 2.1.2.4)**

Total Present Value Cost: \$1,168,000

Verification and validation are performed on Center configuration, Center data conversion, and Center interfaces to ensure compliance with functional and data requirements. Testing includes critical path functional processes that are executed in an integrated environment.

The Center Stress Testing verifies and validates that hardware and software performances meet agreed upon standards. The detailed level of effort is shown in Exhibit 48.

Exhibit 48: Center Rollout Testing Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Center Testing	0.0	0.0	0.0	0.0	0.6	0.5	2.8	2.3
Number of People	0	0	0	0	7	5	13	11
Number of Months	0.0	0.0	0.0	0.0	2.0	2.0	5.0	5.0
Percent of Time	0%	0%	0%	0%	50%	50%	50%	50%

The cost for this element is captured under WBS 2.1.2.5. There will be seven civil servants and five contractors associated with testing during the Rollout phase in year three for two

months at 50% effort. Year four will have 13 civil servants and 11 contractors engaged in testing for five months at 50% time.

- **Security (WBS 2.1.2.5)**
Total Present Value Cost: \$510,000

During this phase, the implementation contractor and the Center Project Team assess current security files for users, determine the user base, identify Center approval paths (workflow) and obtain user security access. Exhibit 49 shows the detailed level of effort for this task.

Exhibit 49: Center Rollout Security Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Security	0.0	0.0	0.0	0.0	0.2	0.2	1.2	1.0
Number of People	0	0	0	0	2	1	3	3
Number of Months	0.0	0.0	0.0	0.0	2.0	2.0	4.5	4.5
Percent of Time	0%	0%	0%	0%	75%	75%	100%	100%

The cost for the element is captured under WBS 2.1.2.5. The task involves two civil servants and one contractor for two months at 75% effort in year three. There will be three civil servants and three contractors in year four engaged in the task for 4.5 months at 100% effort.

- **Travel & Expenses (WBS 2.1.2.6)**
Total Present Value Cost: \$455,000

The contractor travel and expenses are estimated at 15% of the total contractor cost for the remaining Center Implementation phase. This cost is captured under WBS 2.1.2.6.

4.3.2.1.3 Center Data Conversion (WBS 2.1.3)

Total Present Value Cost: \$ 1,541,000

The Center Data Conversion involves the mapping and movement of data from the Center's legacy systems or applications to the selected software application or subsystem. Using Agency Process Team guidelines and requirements for data conversion, the Center Teams 1) analyze the Agency specifications, 2) identify the data sources, 3) define the crosswalks, 4) perform data gap analysis, 5) map Center data to transition data structures, and 6) perform data cleanup, conversion and reconciliation. The detailed level of effort for the task is shown in Exhibit 50.

Exhibit 50: Center Rollout Data Conversion Level of Effort

	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr	Gov't	Cntr
Core HR	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3	Year 4	Year 4
Center Data Conversion	0.0	0.0	0.0	0.0	0.6	0.5	3.3	2.7
Number of People	0	0	0	0	5	4	10	8
Number of Months	0.0	0.0	0.0	0.0	2.0	2.0	4.0	4.0
Percent of Time	0%	0%	0%	0%	75%	75%	100%	100%

The cost for this element is captured under WBS 2.1.3. There will be five civil servants and four contractors engaged in the task in year four for two months at 75% effort. Ten civil servants and eight contractors will be part of the conversion effort in year four for four months at 100% effort.

- **Government (WBS 2.1.3.1)**
Total Present Value Cost: \$352,000
- **Contractor (WBS 2.1.3.2)**
Total Present Value Cost: \$1,034,000
- **Travel & Expenses (WBS 2.1.3.3)**
Total Present Value Cost: \$155,000

The contractor travel and expenses are estimated at 15% of the total contractor cost for the Center Data Conversion phase. This cost is captured under WBS 2.1.3.3.

4.3.2.1.4 Center Training Delivery (WBS 2.1.4)
Total Present Value Cost: \$ 13,303,000

These are the costs to roll out the process and application training courses to each of the nine remaining Centers. During the Rollout, an additional 250 users will receive functional training, 2,700 will receive casual user training, 10 more users will receive technical training, and 18,000 intermittent users will receive training. The training costs include materials, participant time spent in training, cost for trainers, and travel costs for trainers. It is assumed that most of the training is developed during the Agency Design and Pilot phases (80%), with the remaining training (20%) being developed before training is conducted at the Centers. The curriculum is to be role based and closely aligned with business scenarios. The Agency Process Team, along with the Pilot Center's implementation personnel, ensures that the end user training materials incorporate the policies and procedures developed throughout the Agency Design phase and Pilot Implementation phase. The Center Team's activities include analyzing Agency curriculum, identifying users to be trained, and developing tasks associated with training, such as scheduling and creating the environment. The total costs of Center Training Delivery are divided among the following elements.

- **Development (WBS 2.1.4.1)**
Total Present Value Cost: \$277,000

The training development cost for the Center Rollout is estimated to be 20% of the total Agency training development cost. This cost is shown in Exhibit 51.

Exhibit 51: Center Rollout Training Development Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Development - Rollout	Year 3	Year 3	Year 3	Year 3	Year 3	
Cost per day to Develop	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000		
Number of Courses times Days	30	10	10	1		
Total Development Cost	\$ 600,000	\$ 200,000	\$ 200,000	\$ 20,000	\$ 500,000	\$ 1,520,000
% Developed during Rollout						20%
Pilot Development Cost						\$ 304,000

It is estimated that each day of training costs \$20,000 to develop and the number of days per course depends on the training module. The functional training development is for ten courses of three days each. The technical training development is for five courses of two days each. The casual user training development is for two courses of five days each. Lastly, the intermittent training development is for a single, one-day course. (Note: the cost

in Exhibit 51 is presented in constant year dollars, however, the total cost shown under the Development heading is presented in present value dollars.)

- **Training Delivery (WBS 2.1.4.2)**
Total Present Value Cost: \$12,965,000

This element includes the contractor labor costs to deliver the training (time, travel, and expenses), the time the participants spend in training, and course materials. These costs represent the costs associated with training the remaining Center users.

- **Contractor Trainer Cost (WBS 2.4.1.2.1)**
Total Present Value Cost: \$132,000

Exhibit 52 shows the detailed contractor costs for training delivery.

Exhibit 52: Center Rollout Contractor Training Delivery Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Delivery - Remaining Centers	Year 3 & 4	Year 3 & 4	Year 3 & 4	Year 3 & 4		
Students per class	25	50	25	50		
Number of classes	10	54	0	360		
Number of Trainers per Class	2	2	2	2		
Hourly Rate	\$ 175	\$ 175	\$ 175	\$ 175		
Total Trainer Cost	\$ 3,500	\$ 18,900	\$ 140	\$ 126,000		\$ 148,540
Year 3 Total (33%)						\$ 49,513
Year 4 Total (67%)						\$ 99,027

The contractor rate is assumed to be \$175 per hour, and the hours are based on the number of required classes. Three Centers will roll out the system and deliver training in year three and the remaining six Centers will be rolled out and trained in year four. Therefore, 33% of the Center Rollout contractor training delivery cost will be incurred in year three and 67% will be incurred in year four. (Note: the cost in Exhibit 52 is presented in constant year dollars, however, the costs shown under the Training Delivery and Contractor Trainer Cost headings are presented in present value dollars.)

- **Government Participants' Time (WBS 2.4.1.2.2)**
Total Present Value Cost: \$10,891,000

The cost shown in Exhibit 53 shows the cost for the government participants training time.

Exhibit 53: Center Rollout Government Participant Training Time Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Delivery - Remaining Centers	Year 3 & 4	Year 3 & 4	Year 3 & 4	Year 3 & 4		
Number of Participants	250	2,700	10	18,000		
Number of Days	10	4	5	1		
Daily Rate	\$ 390	\$ 390	\$ 390	\$ 390		
Participant Time Cost	\$ 974,696	\$ 4,210,688	\$ 19,494	\$ 7,017,813		\$ 12,222,691
Year 3 Total (33%)						\$ 4,074,230
Year 4 Total (67%)						\$ 8,148,461

It is assumed that the rate for the participants is \$390 per day (based on the annual civil servant loaded salary of \$101,368). The duration of training is dependent upon

the subject matter of the course. Three Centers will roll out the solution in year three and the remaining six Centers will be rolled out in year four. Therefore, 33% of the Center Rollout government participants' training time cost will be incurred in year three and 67% will be incurred in year four. (Note: the cost in Exhibit 53 is presented in constant year dollars, however, the cost shown under the Training Delivery and Government Participants' Time headings are presented in present value dollars.)

— **Materials (WBS 2.4.1.2.3)**

Total Present Value Cost: \$1,942,000

Exhibit 54 shows the cost for training materials.

Exhibit 54: Center Rollout Training Materials Cost (Constant Year)

Type of Training	Functional	Casual	Technical	Intermittent	CBT	TOTAL
Materials - Remaining Centers	Year 3 & 4	Year 3 & 4	Year 3 & 4	Year 3 & 4		
Material Cost per Day of Training	\$ 50	\$ 50	\$ 50	\$ 25		
Number of Courses times Days	30	10	10	1		
Material Cost per User	\$ 1,500	\$ 500	\$ 500	\$ 25		
Number of Users	250	2,700	10	18,000		
Total Material Cost	\$ 375,000	\$ 1,350,000	\$ 5,000	\$ 450,000		\$ 2,180,000
Year 3 Total (33%)						\$ 726,667
Year 4 Total (67%)						\$ 1,453,333

Material costs are based on the material cost per day of training, times the number of total course days, times the number of users within each category of training. System users will receive the full set of course materials for each category of training they take, for reference, even if they do not take all courses within the training category. Three Centers will receive training in year three and the remaining six Centers will receive training in year four. Therefore, 33% of the Center Rollout material cost will be incurred in year three and 67% will be incurred in year four. (Note: the cost in Exhibit 54 is presented in constant year dollars, however, the cost shown under the Training Delivery and Materials headings are presented in present value dollars.)

• **Travel & Expenses (WBS 2.1.4.3)**

Total Present Value Cost: \$61,000

Since civil servants will be trained at the Center where they work, there are no civil servant travel costs associated with Center training. The contractor travel and expenses are estimated at 15% of the total contractor cost for the Center Training Delivery phase. This cost is captured under WBS 2.1.4.3.

4.3.2.1.5 Operations and Sustaining Support (WBS 2.1.5)

Total Present Value Cost: \$ 15,362,000

The O&S costs associated with the new system will begin in FY05, after the system is implemented at the remaining Centers. The IFM Program Office will incur the first two-plus years of O&S costs. (For more detail on the length of time the Program will be responsible for the operations and sustaining support costs, refer to the global cost assumptions at the beginning of this section.) The two-plus years of operations and sustaining support incurred by the Program are reflected under WBS 1.2.3 (BCA Section 4.3.1.2.3). Beginning in FY08, the

Enterprises will pay the O&S costs. These costs are captured under WBS 2.1.5 and are discussed below.

- **Parallel System Operations (WBS 2.1.5.1)**
Total Present Value Cost: \$10,707,000

The Enterprises will incur the costs associated with maintaining the Status Quo through the second quarter of FY05, when the new system will come online. These costs are outlined below.

- **NACC Cost (WBS 2.1.5.1.1)**
Total Present Value Cost: \$1,038,000

These are the costs paid by each Center to the NACC for the management of system hardware and software as well as technical support for systems administration, database administration, and other Agency responsibilities.

Exhibit 55: Parallel System Operations NACC Cost in Present Value (\$000s)
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
2.1.5.1.1 NACC Costs	\$ 301	\$ 298	\$ 294	\$ 145	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,038

- **Agency-wide System Sustaining Support (WBS 2.1.5.1.2)**
Total Present Value Cost: \$0

These are the civil servant and contractor costs for the Agency-wide systems that support the Core HR functions. Due to the difficulty with allocating support costs between Agency-wide and Center-unique systems, the Agency-wide system sustaining support costs are captured under the Center-unique support (WBS 2.1.5.1.3).

- **Center-unique Support (WBS 2.1.5.1.3)**
Total Present Value Cost: \$9,669,000

Due to the difficulty with breaking out costs between Center-unique and Agency-wide systems, software and hardware maintenance of both Agency-wide and Center-unique systems are covered under this cost element. The contractor system support costs were derived from a percentage breakout developed by NASA Core HR subject matter experts.

This cost element address the costs associated with contract and maintenance labor (both corrective and preventive) for all sites. This refers to costs incurred in providing maintenance and repairs for the system hardware regardless of who has “ownership” of the equipment or responsibility for repair. These costs include, but are not limited to, overhaul expenses, programmed maintenance expenses, component repairs, minor facility modifications and upkeep, equipment repairs, second destination transportation, and administrative support required for maintenance operations.

Software maintenance costs include labor to maintain the software and install upgrades and fixes. This element includes the cost of civil servants to perform

software maintenance as well as the fees paid to contractors to perform software maintenance.

Exhibit 56: Parallel Operations Center-unique Support Cost in Present Value (\$000s)
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
2.1.5.1.3 Center Unique Support	\$ 2,824	\$ 2,746	\$ 2,682	\$ 1,417	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9,669
2.1.5.8.3.1 Government	\$ 42	\$ 40	\$ 39	\$ 19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140
2.1.5.8.3.2 Contractor	\$ 2,782	\$ 2,706	\$ 2,643	\$ 1,398	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9,529

— **Functional Support (WBS 2.1.5.1.4)**
Total Present Value Cost: \$0

It is assumed that none of the alternatives will result in a cut in NASA functional staff. Therefore, functional FTEs are not included in the cost estimates.

• **New System Operations and Sustaining Support (WBS 2.1.5.2)**
Total Present Value Cost: \$4,655,000

These are the costs associated with the operations and sustaining support of the new system once the module has been fully implemented and rolled out. The Enterprises will incur this operations and sustaining support cost two-plus years following the Rollout of the module project through a charge-back from the NACC. (For more detail on the length of time the Enterprises will be responsible for the operations and sustaining support costs, refer to the global cost assumptions at the beginning of this section.) The new system operations and sustaining support costs are based on the additional resources required to operate the Core HR functionality on top of the Core Financial system, which is being implemented first. These costs are based on the scope of Core HR functionality and are derived from a percentage of the Core Finance Module's operations and sustaining support costs. The elements that make up this estimate are as follows: Application Functional Support, Application Development Support, and Application Operations Support. This cost element also includes the additional hardware requirements in operating the Core HR module on top of Core Financials.

Exhibit 57: New System Operations and Sustaining Support Cost in Present Value (\$000s)
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
2.1.5.2 New System Operations and Sustaining Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 4,655
2.1.5.2.1 Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 70	\$ 68	\$ 66	\$ 63	\$ 266
2.1.5.2.2 Technical Labor	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,149	\$ 1,114	\$ 1,079	\$ 1,046	\$ 4,388

— **Hardware (WBS 2.1.5.2.1)**
Total Present Value Cost: \$266,000

This cost is derived from the Integration Project's estimate of additional capacity and resources required to operate the Core HR functionalities on top of Core Financials. The estimate is based on the additional memory and CPUs the two Sun E10K servers, at 50% capacity, would require to handle the additional workloads of Core HR.

— **Technical Labor (WBS 2.1.5.2.2)**
Total Present Value Cost: \$4,388,000

This is composed of technical experts with profound technical expertise of SAP. The skills would include BASIS administration, database administration, operating

systems administration, configuration management, and transport control to name a few. Technical labor falls under the following categories:

- **Application Functional Support**
This entails items such as Tier 2 help desk support, "How-To" support, and table configuration. The support staff is often referred to as "functechs" who possess functional specific (e.g., Core HR) knowledge of the system.
- **Application Development Support**
This entails support staff who are ABAP programmers who can develop extensions to the core SAP software and bolt-ons. This also includes Enterprise Application Integration (EAI) experts with programming skills who can maintain interfaces between multiple systems such as SAP and Legacy systems. This can also include staff with Business Warehousing (BW) expertise.
- **Application Operations Support**
This is composed of technical experts with profound technical expertise of SAP. The skills would include BASIS administration, database administration, operating systems administration, configuration management, and transport control to name a few.

4.4 Cost Comparison

The total ten-year present value costs for each viable alternative is depicted below.

Exhibit 58: Cost Summary Table – 10-Year Present Value Costs (\$000's)
Present Value Dollars (Discount Rate 3.2%)

	WBS Element	Status Quo	SAP
Investment Cost			
Program Management (Program Cost)	1.1	\$ -	\$ -
Integration Project (Program Cost)	1.2.1+1.2.2	\$ -	\$ 1,275
Core HR Module Project (Program Cost)	1.3	\$ -	\$ 18,189
Core HR Module Project (Enterprise Cost)	2.1.1...2.1.4	\$ -	\$ 20,995
Total Investment Costs		\$ -	\$ 40,458
Operations and Sustaining Support			
Integration Project (Program Cost)	1.2.3	\$ -	\$ 5,307
Core HR Module Project (Enterprise Cost)	2.1.5	\$ 28,014	\$ 15,362
Total O&S Costs		\$ 28,014	\$ 20,669
Total Present Value Cost		\$ 28,014	\$ 61,127

5 BENEFIT ANALYSIS

In addition to evaluating an investment based on its life cycle costs, the qualitative and quantitative benefits to NASA and its customers need to be considered. This section presents the benefits associated with the Status Quo and SAP alternatives.

The benefits associated with each potential alternative were divided into two categories: quantitative benefits and qualitative benefits. Quantitative benefits represent the dollar savings or avoidance that will result from the implementation of SAP as a replacement for the Core HR legacy systems. These benefits represent savings generated from reduced operations and sustaining support costs and cost avoidances of contractor support that would otherwise be required to support NASA's business drivers.

Qualitative benefits were identified as they relate to NASA's business drivers and Core HR's functional drivers, identified in the Case For Change section of this report. Specific examples of how the Status Quo system and the SAP alternative either fully, partially, or fails to support these drivers are included in this analysis and are numerically scored based on the guidance included in Exhibit 59.

Exhibit 59: Benefit Scoring Definitions

Business Driver	Fully Meets (3)	Partially Meets (2)	Does Not Meet (1)
1 Timely and consistent information for management decisions	<p>Score 3</p> <p>Provides a single data/reporting source. AND Data can be consolidated to meet the needs of multiple organizations at the same time. AND Provides tools for data analysis or reporting. AND Information is available in timely fashion (real time or as needed).</p> <p>Provides a single set of Agency systems that reduce the amount of repetitive data entry. The system will create a consistent and standard set of data.</p> <p>Fully meeting this driver reduces the number of Center-unique systems and the need to maintain multiple systems.</p>	<p>Score 2</p> <p>Provides single data/reporting source. OR Data can be consolidated to meet the needs of multiple organizations at the same time. OR Provides tools for data analysis or reporting. OR Information is available in timely fashion (real time or as needed).</p> <p>Provides a minimal set of systems with some repetitive data entry. Some data is standardized, but inconsistent non-standard data and a few Center-unique systems still exist.</p>	<p>Score 1</p> <p>Provides no tools for analysis and reporting. Multiple data sources must be analyzed to determine true source. Data must be manually transferred from one organization to another. Separate and unique systems exist throughout the Agency. These systems include multiple sets of data and require redundant data entry.</p>
2 Improve NASA's accountability and enable full cost management	<p>Score 3</p> <p>Fully automated collection of full cost for determining total program costs and relating costs to value.</p>	<p>Score 2</p> <p>Able to support the collection of full costs, but only with extensive interfaces, spreadsheets, or manual intervention.</p>	<p>Score 1</p> <p>Unable to support the collection of full costs for tasks, projects, or activities.</p>

Business Driver		Fully Meets (3)	Partially Meets (2)	Does Not Meet (1)
3	Achieve efficiencies and operate effectively	<p>Score 3</p> <p>In order for an alternative to fully meet this driver, it should provide tools, processes, or opportunities for significant improvement in the quality of customer service (or cost savings) and allow for value added services, given the downsized workforce and reduced budget.</p>	<p>Score 2</p> <p>Offers some improvement in the number or types of services provided and in the quality of customer service. Offers some potential for cost savings.</p>	<p>Score 1</p> <p>Provides the minimum level of compliance with legal obligations, and provides minimal services and standards of service.</p>
4	Exchange information with customers and stakeholders	<p>Score 3</p> <p>Provides an integrated and consolidated information source to facilitate sharing accurate and real time information with customers. In order for an alternative to fully meet this driver, the system will also utilize e-commerce strategies to disseminate and share information, and customers will be able to directly access appropriate information from their desktop.</p>	<p>Score 2</p> <p>Provides a somewhat integrated or consolidated information source. The system may take advantage of some e-commerce strategies. Customers can access some information from their desktop.</p>	<p>Score 1</p> <p>Provides no consolidated or integrated information source and utilizes no e-commerce strategies.</p>
5	Attract and retain a world class workforce	<p>Score 3</p> <p>Automates most manually intensive processes. Supports the creation of new on-the-job roles and responsibilities that increase the ability of NASA employees to enhance skills. If applicable, increases the timeliness of the recruiting and hiring process for potential applicants.</p>	<p>Score 2</p> <p>Automates some manually intensive processes. OR Supports the creation of new on-the-job roles and responsibilities that increase the ability of NASA employees to enhance skills. OR, If applicable, increases the timeliness of the recruiting and hiring process for potential applicants.</p>	<p>Score 1</p> <p>Provides little or no mechanisms to eliminate manually intensive processes or expand the ability of NASA employees to gain enhanced on-the-job skills. If applicable, has no impact on increasing the timeliness of the recruiting and hiring process for potential applicants.</p>

5.1 Summary of Benefits

By implementing the SAP solution, NASA will benefit in dollar terms by cost savings and cost avoidances, as well as from performance and productivity gains from process efficiencies as well as increased functionality.

The fully integrated Agency-wide solution allows for cost savings that are generated by the significant reduction or elimination of Center-specific operations and sustaining support costs as well as a reduction in overall contractor support. Additionally, under the legacy systems, NASA is unable to fully meet any of its business and functional drivers. To create an environment that

could meet these drivers, NASA would need to hire contractor support to undertake the administrative tasks that currently burden Core HR personnel and prevents them from taking on more consultative roles. SAP is an automated solution, so many of these duplicative and manual administrative tasks will be eliminated or minimized, allowing Core HR professionals to transition into more strategic roles. Therefore, with SAP, NASA would avoid these costly contractor support costs necessary for the current environment to meet NASA's business drivers.

In addition to these quantitative gains, the SAP alternative allows NASA to fully meet its business and functional drivers by providing a system with increased functionality, such as automated workflow and real time data transfer in an integrated environment. These attributes allow for improved productivity and efficiency for Core HR professionals, managers and employees in Core HR-related processes and activities.

Although SAP's HR functionality is currently undergoing federalization, the qualitative benefits were evaluated under the assumption that SAP will be fully federalized upon implementation of the Core HR module. The possibility that SAP will not be fully federalized upon implementation is accounted for in the risk analysis.

5.2 Quantitative Benefits

The quantitative benefits for the Status Quo and SAP solution were grouped into two categories, system savings and contractor cost avoidance.

5.2.1 System Savings

The system savings measure the reduction in operations and sustaining support costs between the Status Quo system and the SAP alternative. The operations and sustaining support costs for Core HR are based on the cost of additional resources required to support the Core HR functions on top of the Core Financial system. This cost was provided by the Integration Project Office.

Exhibit 60: Present Value System Savings (\$000s)
(Discount Rate 3.2%)

			FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Status Quo	FS 41	Total O&S Costs (41)	\$ 42	\$ 40	\$ 39	\$ 38	\$ 37	\$ 36	\$ 34	\$ 33	\$ 32	\$ 31	\$ 362
	FS 42	Total O&S Costs (42)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	FS 43	Total O&S Costs (43)	\$ 3,084	\$ 3,004	\$ 2,937	\$ 3,086	\$ 2,798	\$ 2,712	\$ 2,628	\$ 2,546	\$ 2,467	\$ 2,391	\$ 27,652
		Total O&S	\$ 3,125	\$ 3,044	\$ 2,976	\$ 3,124	\$ 2,835	\$ 2,747	\$ 2,662	\$ 2,579	\$ 2,499	\$ 2,422	\$ 28,014
SAP	Fund Source 41	Operations and Sustaining Support											
		Integration Project (Program Costs 1.2.3)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
		Module Project (Enterprise Costs 2.1.5)	\$ 42	\$ 40	\$ 39	\$ 19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140
		Total O&S Costs	\$ 42	\$ 40	\$ 39	\$ 19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140
		Total System Savings	\$ -	\$ -	\$ -	\$ 19	\$ 37	\$ 36	\$ 34	\$ 33	\$ 32	\$ 31	\$ 222
	Fund Source 42	Operations and Sustaining Support											
		Integration Project (Program Costs 1.2.3)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
		Module Project (Enterprise Costs 2.1.5)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
		Total O&S Costs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
		Total System Savings	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Fund Source 43	Operations and Sustaining Support											
		Integration Project (Program Costs 1.2.3)	\$ -	\$ 330	\$ 1,304	\$ 1,263	\$ 1,224	\$ 1,186	\$ -	\$ -	\$ -	\$ -	\$ 5,307
		Module Project (Enterprise Costs 2.1.5)	\$ 3,084	\$ 3,004	\$ 2,937	\$ 1,543	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 15,222
		Total O&S Costs	\$ 3,084	\$ 3,333	\$ 4,241	\$ 2,806	\$ 1,224	\$ 1,186	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 20,529
		Total System Savings	\$ -	\$ (330)	\$ (1,304)	\$ 280	\$ 1,574	\$ 1,525	\$ 1,408	\$ 1,365	\$ 1,322	\$ 1,281	\$ 7,123
		SAP LC System Savings	\$ -	\$ (330)	\$ (1,304)	\$ 298	\$ 1,611	\$ 1,561	\$ 1,443	\$ 1,398	\$ 1,355	\$ 1,313	\$ 7,345

As seen in Exhibit 60, the SAP alternative begins to generate system savings in FY05 in the amount of \$298,000, which accrues to a total system savings for the 10-year life cycle (present value) of \$ 7.3 million. By implementing SAP, there is a 25 percent reduction in operations and sustaining support costs over the system's life cycle.

5.2.2 Contractor Cost Avoidance

In addition to the above savings that result from reduced operations and sustaining support costs, this analysis also identified a cost avoidance of not having to hire an additional 78 FTEs.¹² This additional staff is necessary to respond to the overburdened Core HR staff that is currently unable to perform its primary duty of being a strategic partner. In order for the Status Quo to better meet NASA's drivers, this additional contractor staff would be required to process administrative Core HR tasks. With these added resources, NASA Core HR personnel would be able to focus on their primary role as strategic partners, change agents, and employee champions. These consultative roles are critical to NASA meetings its Business Drivers under the Status Quo.

The cost avoidance of not having to hire the estimated 78 contractor staff needed to support Core HR processes is approximately \$4 million per year, based on an annual contractor rate of approximately \$58,000. This rate is substantially below the implementation contractor rate assumed in the Cost Analysis because of the nature of the work involved. The contractors being analyzed for the cost avoidance would perform basic transactional type work and would not be highly skilled. The implementation contractor rate is substantially higher due to the highly skilled workers needed to implement SAP's ERP system. The contractor cost avoidance 10-year present value cost totals \$38 million. The details of this cost avoidance are shown in Exhibit 61.

Exhibit 61: Present Value Contractor Cost Avoidance
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Contractor Cost Avoidance	\$ 4,360,465	\$ 4,225,257	\$ 4,094,241	\$ 3,967,288	\$ 3,844,271	\$ 3,725,069	\$ 3,609,563	\$ 3,497,639	\$ 3,389,185	\$ 3,284,094	\$37,997,072

5.2.3 Total Quantitative Benefits

Exhibit 62 presents the total 10-year present value quantitative benefits for the SAP alternative. The contractor cost avoidance and system savings of the SAP alternative yield a benefits stream averaging \$4.5 million a year for a 10-year life cycle total of \$45 million in present value.

Exhibit 62: Total Present Value Quantitative Benefits (\$000s)
(Discount Rate 3.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
System Savings	\$ -	\$ (330)	\$ (1,304)	\$ 298	\$ 1,611	\$ 1,561	\$ 1,443	\$ 1,398	\$ 1,355	\$ 1,313	\$ 7,345
Civil Servant Cost Avoidance	\$ 4,360	\$ 4,225	\$ 4,094	\$ 3,967	\$ 3,844	\$ 3,725	\$ 3,610	\$ 3,498	\$ 3,389	\$ 3,284	\$ 37,997
Total Benefits	\$ 4,360	\$ 3,896	\$ 2,790	\$ 4,266	\$ 5,455	\$ 5,286	\$ 5,052	\$ 4,896	\$ 4,744	\$ 4,597	\$ 45,342

¹² Due to the 36% reduction in HR civil service staff since 1993, the HR community is overburdened with transactional type work and has inadequate resources to act as a strategic partner, change agent, and employee champion. The Human Resources Transactional Services Contracting study concluded 78 FTEs would be needed Agency-wide in order to relieve the HR community's transactional work burden and allow them to shift to their primary mission of being a strategic partner.

5.3 Qualitative Benefits

This section evaluates the qualitative benefits associated with the Core HR functional drivers for each alternative. For the second business driver, *Improve NASA's accountability and enable full cost management*, the full cost management attribute will not be fully realized until all HR modules (e.g., Payroll and Time and Attendance) are implemented. However, since implementing Core HR lays the foundation necessary for full cost management, the qualitative benefits are assessed based on the capabilities of SAP once all HR functionalities are fully implemented.

5.3.1 Status Quo

The Status Quo alternative partially meets the requirements for two of the twelve Core HR functional drivers and fails to meet the ten other drivers. The current system is labor intensive and does not allow Core HR professionals to perform sufficient value added services such as career counseling, grievance resolution, and benefit analysis. Taking these factors into consideration, the benefits of continuing with the Status Quo are low. Further details are provided in Exhibit 63.

Exhibit 63: Qualitative Benefits of Status Quo

BD	Functional Drivers	Status Quo
1. Provide timely, consistent, and reliable information for management decisions	Strategic workforce planning and allocation ability based on competencies	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> Does not support Enterprise and Project managers with tools to provide sensitivity analysis on labor skills and position requirement for strategic planning. The current system does not allow manager to perform "what if" scenarios for succession planning with the impact on budget limitations. Additionally, the current system does not provide readily accessible skills data to maximize the utility of the workforce. Does not provide Enterprise and Project managers with the tools to facilitate strategic decision making. The current system does not provide the ability to perform "what if" analyses on their organization to enable faster response in hiring decisions, succession planning, organizational changes, and identification of skill gaps and training requirements. Furthermore, the current system provides limited linkage between personnel costs and project budget.
	Link employee competencies, future needs and employee development to ensure strategic requirements	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> Inadequate data tracking for strategic workforce management. The legacy systems only track limited employee data. The current systems do not support workforce planning or training needs. Additionally, the systems provide no way to manage competencies from a current skills basis or a future needs basis. Competency studies and planning are ad hoc efforts and quickly outdated.

BD	Functional Drivers	Status Quo
2. Improve NASA's accountability and enable full cost management	Workforce allocation to highest priority programs and projects	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> Does not allocate critical resources to highest priority programs. The current stove pipe legacy systems do not possess full cost accounting capability and do not enable managers to allocate critical and scarce resources to programs or projects of the highest priority in a time of diminishing budget.
	Time and Attendance and Labor Distribution to tie employee cost to programs and projects	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> Legacy systems are incapable of attributing employee labor cost to programs or projects. Current Time and Attendance systems and Labor Distribution methods are incapable of capturing cost associated with project or program labor. The systems are either manual or rudimentary electronic-based systems that do not have the ability to discern the time each employee spent on the individual program or project.
	Improved management of training, awards and salaries	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> Does not support the full cost management of employee training, awards, and salaries. The legacy Core HR system does have limited ability to capture employee awards and salary action. Most of this type of data is resident within the NPPS, which Core HR shares with Payroll. However, the Core HR capabilities are rather limited and access to such data requires a specific technical skill set. Financial data from the system is not readily available for management decisions and does not facilitate full cost accounting. <p>Training information is stored in separate databases from the financial data in NPPS and requires technical knowledge in accessing the information.</p>

<p>3. Achieve efficiencies and operate effectively</p>	<p>Improve efficiency of operations through: consolidation of processes and procedures, self service input of data and verification, automated work flow, faster processing of transactions and consistent data quality</p>	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> <p>Does not eliminate Center-unique systems. Each Center operates a personnel system independent of others, therefore, only required data is filtered through the consolidated system and shared within the Agency.</p> <p>Routing and workflow is executed manually. HR professionals manually track the processing of transactions such as status of personnel actions. Although HR professionals are able to facilitate some transactions electronically (email and facsimile), the current HR process does not provide a single-corresponding tool that is supported by an electronic workflow. The current process is time and resources consuming because HR professionals are bogged down with sorting, storing, and filing documents.</p> <p>An electronic workflow environment would establish routing protocols for personnel transactions, which would support timely completion. This includes routing the SF-52 to managers for electronic signatures and approval.</p> <p>Requires duplicate processes with multiple points of entry. HR professionals currently enter personnel information manually into forms such as an SF-52, which is executed by a specialist and/or admin person who initiates a personnel action. This information is then manually re-keyed into NPPS to create the SF-50.</p> <p>Multiple entries of data cause introduction of errors and inconsistencies; therefore, additional validation of data is required to ensure accuracy.</p> <p>Manual and time intensive efforts are necessary to remain compliant with Federal and functional requirements. The current process consumes a great deal of time and manual labor in the effort to remain compliant with requirements due to the complex process of incorporating changes. This process usually involves manually receiving Federal regulatory notices, researching and analyzing methods to incorporate the new requirement into current business and technical process, developing technical solution for new requirement, testing new functionality, deploying new functionality into production environment and training users.</p> <p>Does not support consistent data for managers or the Agency. Data is currently stored in multiple databases on different Centers' NPPS and CAPPs. Data stored in multiple locations results in data inconsistencies, which in turn causes inaccuracy in reporting at the Center and Agency level (e.g., awards data).</p>
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4. Exchange information with customers and stakeholders	Ability to move from transaction based orientation to consultative services for: organizational effectiveness, succession planning, career path management, and change management	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> • Core HR professionals have limited flexibility to take on more consultative roles because the current process consists of many administrative and non-value added efforts. Core HR professionals should participate in more consultative activities such as advising new hires, assisting in personnel development, and conducting exit interviews. However, the current labor intensive administrative processes do not allow enough discretionary time for HR professionals to engage in these desired activities. • Due to the level of effort required in executing daily and administrative personnel activities, Core HR professionals are not able to spend time focusing on supporting managers. Core HR professional could assist managers in identifying skill gaps within their organization, developing organizational and job series training plans, and supporting organizational changes. <p>HR professionals could also elicit feedback from employees on potential issues within the organization and communicate these issues with management to affect change.</p> <p>HR professionals could focus on negotiation and resolution of grievances.</p>
	Share personnel, hiring and competency information across Centers	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> • Does not support employee transfers between Centers The current personnel system does not support the smooth transfer of employees between Centers because of Centers' use of unique systems and disparate databases. Currently, an employee's paper file must be sent to the new Center (the electronic file remains at the old Center and a new file is started at the new Center).
	Employee self service capabilities	<p><u>Partially Meets (2)</u></p> <ul style="list-style-type: none"> • Enable NASA employee self-servicing NASA employees are able to access and edit some pertinent employee information via a web-based self-servicing tool. However, the self-servicing tool does not reside in the same application as the personnel system; therefore, information retrieved from the self-servicing tool from the personnel system is not real time. Furthermore, the current self-servicing tool does not provide a wide range of personnel transactions such as initiating retirement actions, completing new employee orientation materials electronically, and supporting "what if" scenarios for retirement benefits.
	Management self service capabilities	<p><u>Does Not Meet (1)</u></p> <ul style="list-style-type: none"> • Enable NASA management self-servicing NASA management is not able to access pertinent employee information via a self-servicing tool.

5. Attract and retain a world class workforce	Improve planning and development based on competencies	<u>Partially Meets (2)</u> <ul style="list-style-type: none"> Legacy systems are incapable of practicing strategic planning based on employee competencies. The current system does not provide the ability to track employee competencies and identify skill gaps between the skills and training requirements. In the current environment, the COTS training software AdminSTAR is capable of tracking employee training data. However, the training data is not linked to an employee competency database so that it can be used for personnel planning and skills development.
	Accelerate personnel actions	<u>Does Not Meet (1)</u> <ul style="list-style-type: none"> Manual execution of routing and workflow HR professionals manually track the processing of transactions such as status of personnel actions. Although HR professionals are able to facilitate some transactions electronically (email and facsimile), the current HR process does not provide a single, corresponding tool that is supported by an electronic workflow. The current process is time and resources consuming because HR professionals are bogged down with sorting, storing, and filing documents. This manually based process does not accelerate personnel actions. Current process times are lengthy and employees are often forced to contend with delayed personnel actions. <p>An electronic workflow environment would establish routing protocols for personnel transactions, which would support timely completion. This includes routing the SF-52 to managers for electronic signatures and approval.</p>

5.3.2 SAP

The SAP solution fully meets all twelve of the functional drivers, making the qualitative benefits of implementing SAP very high. SAP will enable managers to track pertinent employee information, eliminate Center-unique systems and calculate and supply key personnel data for projects. Additionally, NASA employees and managers will be able to initiate an increased variety of self-servicing transactions. Finally, as a direct result of the streamlining initiatives provided by COTS packages, HR professionals will be able to spend less time on non-value added services and will be able to spend more time focusing on the needs of managers. Further details are provided in Exhibit 64.

Exhibit 64: Qualitative Benefits for SAP solution

BD	Functional Drivers	SAP
1. Provide timely, consistent, and reliable information for management decisions	Strategic workforce planning and allocation ability based on competencies	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> The SAP HR solution provides fully integrated HR management functions. This allows for strategic management by providing managers with tools to extract pertinent data and conduct sensitivity and position requirements analyses. Integrated benchmarks from industry sources assist in creating simulations that assess the impact of changes in program management to better assist in faster and more accurate response decisions regarding hiring, employee retention, and other strategic and organizational changes. <p>In addition, using the workforce performance scorecards, these simulation scenarios also allow HR's internal decisions to be in synch with NASA's strategic goals.</p> <p>Creating "what-if" scenarios (e.g., what if I had a flatter organization, what if I had more supervisors, etc.) that align HR goals with NASA's strategic goals not only can assess impacts on that particular scenario, but can also assess the cause-effect relationship of how the decision will impact other NASA initiatives.</p>
	Link employee competencies, future needs and employee development to ensure strategic requirements	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Provides managers with access to employee information. SAP will enable managers to generate ad hoc reports and query the personnel system. This will assist managers in making decisions on promotions, awards, and training opportunities. The system will also be able to track the performance of each employee against his or her performance plan. Additionally, the system will provide extensive training related activities such as the ability to electronically manage training deliverables, schedules, equipment, training library, and employees' skills.
2. Improve NASA's accountability and enable full cost management	Workforce allocation to highest priority programs and projects	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Provides cost and budgetary tracking for full cost accounting capabilities. SAP allows HR professionals and project managers to develop and maintain balanced scorecards in which program objectives, constraints, and other planning and strategic information can be placed. With this information, changes within the workforce can be simulated and revised according to program needs, such as budgetary changes, staffing shortages, personnel leaves, etc. (This benefit will be realized only after the Rollout of the other HR related SAP modules such as Payroll and Time and Attendance.)
	Time and Attendance and Labor Distribution to tie employee cost to programs and projects	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Tie costs to programs and projects. Using the balanced scorecards, managers and HR personnel can review real time information of cost and budget information and use this data to simulate any changes required according to program needs.

	Improved management of training, awards and salaries	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Allows managers to initiate and track applicable personnel actions. With SAP, managers can initiate a personnel action directly in the system. These actions can include creating awards, promotions, separations, and new hires. Managers can then track the status of these actions through the system. <p>Managers can also compare compensation packages using internal and external data.</p> <p>SAP maintains a profile of employee's skills and assets, which the employee can access and update as appropriate in real time. Managers are also kept informed of pertinent information changes through the automated workflow tool.</p>
3. Achieve efficiencies and operate effectively	Improve efficiency of operations through: consolidation of processes and procedures, self service input of data and verification, automated work flow, faster processing of transactions and consistent data quality	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Eliminates duplicative processes with a single point of entry In the legacy environment, an SF-52 is completed by a personnel specialist and/or administrative employee to initiate a personnel action. This information is then manually re-keyed into NPPS to create the SF-50. The SAP solution will eliminate the manual completion of the SF-52 and the data will be directly keyed into the system a single time. <p>SAP empowers employees with a suite of tools and self-service features that allow them to actively manage and maintain their personal information. Embedded automated workflow tools notify the assigned managers or other personnel of specific changes or actions required in real time.</p> <p>SAP can accept information from the Resume Management and Positions Description Management systems. Therefore, this information will not have to be re-keyed into the Core HR module. Furthermore, a new hire can directly enter their personal information into the Core HR module instead of manually completing forms that will need to be re-keyed into the system.</p> <ul style="list-style-type: none"> Eliminates Center-unique systems SAP will consolidate functionality contained in various Center-unique systems into a single system and will consolidate HR information into a central database. Managers across all Centers will then have access to the same set of information. This will also support access to aggregate personnel information across all Centers.

4. Exchange information with customers and stakeholders	Ability to move from transaction based orientation to consultative services for: organizational effectiveness, succession planning, career path management, and change management	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> • The streamlining initiatives included in SAP will reduce the amount of time spent on manual non-value added processes and enable HR professionals to spend more time focusing on supporting managers and employees. <p>With more time, HR staff can become more forward thinking. HR professionals can identify employee skill gaps leading to the establishment of individual development plans, meet with employees to discuss benefit options, establish new benefit initiatives, create a more tailored and informative employee orientation, and conduct follow-ups on new hires. HR professionals can also elicit and respond to feedback from employees on ways to improve the work environment. Furthermore, HR professionals will spend less time administering daily routine activities and more time managing strategic initiatives.</p> <p>HR professionals can also assist employees by working through issues between the employee and management before it reaches a grievance level.</p>
	Share personnel, hiring and competency information across Centers	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> • Supports employee transfers. <p>SAP will support the smooth transfer of employees between Centers. Employees can transfer from one Center to another without having to process a losing action at the old Center and a gaining action at the new Center. With SAP, an employee's file will be accessible to the Center once the employee's Center affiliation is changed. Currently, an employee's paper file must be sent to the new Center (the electronic file remains at the old Center and a new file is started at the new Center). The SAP solution will support the electronic transfer of an entire file along with all of its historical information.</p>
	Employee self service capabilities	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> • Enables NASA employee self-servicing. <p>With SAP, NASA employees will be able to directly initiate a wider range of personnel transactions including initiating retirement actions, completing new employee materials electronically, and supporting "what if" scenarios for retirement benefits.</p> <p>The system will also provide on-line updates and confirmation that specific changes have occurred. Furthermore, employees will have access to their Official Personnel Folder (OPF). Employees will be able to verify information contained in their OPF and correct any errors or notify a HR professional of the errors.</p> <p>SAP will complete employee personnel actions in a more timely manner as a result of these streamlined processes.</p>
	Management self service capabilities	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> • Enables NASA management self-servicing. <p>With SAP, NASA management will be able to directly initiate a wider range of personnel transactions facilitated by the improved accessibility of personnel data. Tools such as SAP's Business Warehousing (BW) capability enables reporting and data mining capabilities which allows management to query personnel data for management transactions.</p>

5. Attract and retain a world class workforce	Improve planning and development based on competencies	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Provides competency, training, and personnel development tracking. Managers will be able to plan, assess, and revise program objectives, timeline, and budgets based on real time data to ensure that the project is aligned with NASA's strategic goals. <p>With SAP, managers will also create simulation scenarios to measure the potential impact on the project or on other programs for continual optimization of workforce composition and other resources.</p> <p>As part of a consultative role, SAP will enable HR professionals to conduct exit interviews. These interviews will identify reasons for separation. NASA can then use this information to improve the work environment to attract and retain future employees.</p>
	Accelerate personnel actions	<p>Fully Meets (3)</p> <ul style="list-style-type: none"> Provides for electronic workflow environment. Will enable HR professionals to easily and quickly identify the status of personnel actions. This information will be contained in the HR module and will be at users' fingertips, as opposed to tracking down a piece of paper. An electronic workflow environment will also reduce time and costs associated with sorting, storing, and filing documents. <p>An electronic workflow environment will establish routing protocols for personnel transactions, which will support their timely completion. This includes routing the SF-52 to managers for electronic signature and approval.</p>

5.3.3 Qualitative Benefits Summary

Based on this analysis of the Status Quo and SAP, the overall scoring against each of the business drivers and the corresponding Core HR functional drivers is provided in Exhibit 65. In addition, each driver was assigned a weight. The results of the benefit analysis and ability of each alternative to satisfy the business drivers is included on the final line of the table.

Exhibit 65: Benefit Score Summary

BD	Functional Driver	Weight	Status Quo	SAP
1	Strategic workforce planning and allocation ability based on competencies		1	3
	Link employee competencies, future needs and employee development to ensure strategic requirements		1	3
	Average of BD #1	30%	1.0	3.0
2	Workforce allocation to highest priority programs and		1	3
	Time and Attendance and Labor Distribution to tie the employee cost to program and projects		1	3
	Improve management of training, awards and salaries		1	3
	Average of BD #2	20%	1.0	3.0
3	Improve efficiency in operation		1	3
	Ability to move from transaction-based orientation to consultative services		1	3
	Average of BD #3	20%	1.0	3.0
4	Share personnel, hiring, and competency information across Centers		1	3
	Employee self-service capabilities		2	3
	Management self-service capabilities		1	3
	Average of BD #4	15%	1.3	3.0
5	Improve planning and development based on competencies		2	3
	Accelerate personnel action		1	3
	Average of BD #5	15%	1.5	3.0
Weighted Average Ranking		100%	1.1	3.0
			Red	Green

The numerical score was converted to a red, yellow, or green rating based on the following scale:

Score	Benefit	Color
1.0 – 1.6	Low Benefit	Red
1.7 – 2.3	Average Benefit	Yellow
2.4 – 3.0	High Benefit	Green

5.3.4 Performance Measures

In order to assess the potential success of the SAP solution and the impact of the solution on HR personnel, managers, and NASA employees, a review was conducted. The review covers the efficiency gains in the key areas of increased functionality and productivity. These key areas are mapped back to NASA's five business drivers and the associated Core HR functional drivers as shown in Exhibit 66.

Exhibit 66: Performance Measures

Business Driver	Functional Driver	Performance Measures
1 Provide timely, consistent, and reliable information for management decisions	<ul style="list-style-type: none"> • Strategic workforce planning and allocation ability based on competencies • Link employee competencies, future needs and employee development to ensure strategic requirements 	<ul style="list-style-type: none"> • Demonstrate the capability to collect and store applicant data, and provide capabilities to analyze the data in order to determine staff competencies in the current workforce • Increase percentage of competency data available for current employees • Develop tactical HR plans covering hiring, promotions and training by Center • Increase percentage of workforce capacity utilization • Increase percentage of workforce competency utilization
2 Improve NASA's accountability and enable full cost management	<ul style="list-style-type: none"> • Workforce allocation to highest priority programs and projects • Time and Attendance and Labor Distribution to tie employee cost to programs and projects • Improved management of training, awards and salaries 	<ul style="list-style-type: none"> • Make total cost of labor available to project managers • Increase the timeliness and relevancy of available cost reports for projects
3 Achieve efficiencies and operate effectively	<ul style="list-style-type: none"> • Improve efficiency of operations through: consolidation of processes and procedures, self service input of data and verification, automated work flow, faster processing of transactions and consistent data quality • Ability to move from transaction based orientation to consultative services for: organizational effectiveness, succession planning, career path management, and change management 	<ul style="list-style-type: none"> • Decrease percentage of paper forms and copies • Decrease number of HR staff engaged in transaction processing compared to number engaged in management advisory services • Increase number of consultative cases provided to employees in areas of career management • Increase number of types of advisory services offered to employees • Percentage increases in workforce capacity utilization
4 Exchange information with customers and stakeholders	<ul style="list-style-type: none"> • Share personnel, hiring and competency information across Centers • Employee self service capabilities • Management self service capabilities 	<ul style="list-style-type: none"> • Increase number of HR staff trained to access Agency-wide HR information • Increase number of self-service transactions via self-servicing tool for employees and managers
5 Attract and retain a world class workforce	<ul style="list-style-type: none"> • Improve planning and development based on competencies • Accelerate personnel actions 	<ul style="list-style-type: none"> • Decrease/eliminate discrepancy in cost between annual hiring and training plans for Centers compared to the actuals • Reduce total processing time for hire, promotion and reassignment actions

6 RISK ANALYSIS

The previous sections of this BCA discussed the estimated costs and the expected benefits associated with each alternative. This section presents the risks associated with each of the two viable alternatives.

There are various ways to categorize risks that affect information technology (IT) investment projects, but for the purposes of this process, the following risk categories were selected: integration complexity risk, market risk, technical risk, and implementation risk. These categories are defined as follows:

- **Integration Complexity Risk:** This category includes risks associated with the number of data dependencies, the number of actual interfaces between this module and other modules, and the technical issues involved in programming the application solutions.
- **Market Risk:** This category includes risks associated with the stability of vendors and their software and related tools and services within the market (in this case Federal HR commercial off-the-shelf [COTS] product market). Market risk may increase or decrease depending on such factors as the number of vendors or products within the market and the degree to which specific products are tested and implemented in a production environment similar to NASA's intended use.
- **Technical Risk:** This is risk associated with technical aspects of the module's design and support. This includes the maturity of software products, the degree to which products employ the latest standards in technology and design, the availability of skilled resources to support the product, and the degree of tailoring required.
- **Implementation/Project Risk:** This category includes risks associated with module implementation. It addresses factors such as the thoroughness of project approach and plan, the degree to which plans incorporate risk mitigation techniques, and the impact of not meeting or adjusting the project's anticipated timeline.

The alternatives were scored in each of the risk categories according to the scale shown below:

Score	Risk
1	Low Risk
2	Average Risk
3	High Risk

Furthermore, at the end of this chapter, a cost risk section identifies the major cost drivers for each of the alternatives.

6.1 Integration Complexity Risk

Integration Complexity Risk includes the following risk factors:

- Degree of data dependencies
- Interface complexity
- Technical compatibility

Degree of Data Dependencies: This factor refers to the exchange or flow of information between this Module and other Modules, legacy systems, Agency-wide systems, and external systems. It focuses particularly on the relationship or level of reliance on data from other Modules. In terms of risk, this factor is evaluated based on number of data dependencies, that is, the more dependencies that exist, the more risky it is for integration because more data relationships are at stake.

Interface Complexity: This factor refers to the number of actual interfaces facilitating the flow of information between this Module and other Modules. Furthermore, it explores the complexity in which those interfaces interact and identifies interfaces that are most critical to this Module. In terms of risk, this factor is evaluated based on the number and complexity of interfaces involved. In other words, the more interfaces that are involved, the more risky it is for integration due to the impacts on technical and business relationships. Furthermore, there are complex two-way interfaces that bridge together differing environments (e.g., pulling data from a Windows-based system and converting it into DOS format to be read by a DOS-based system).

Technical Compatibility: This factor refers to the compatibility of the Module's technical solution with other Module solutions—how well this Module alternative can fit within (integrate with) the overall IFM technical architecture and configuration. For instance, an alternative based on antiquated technology may be considered high risk because it involves greater effort to integrate with other more technologically advanced solutions.

For the Status Quo alternative, the degree of data dependencies and interface complexity risk factors both received a low score because currently Personnel only links with Payroll and Employee Express. It is important to note that although the legacy systems have relatively low integration complexity risk, they also have very few benefits that would be associated with a more integrated solution. The legacy systems received an average technical compatibility risk score because the systems are currently integrated into the overall IFM architecture and can be integrated into future IFM architecture with moderate effort.

The SAP alternative has low risk ratings for the integration complexity category. The SAP product is built around a common database, which ensures that data is immediately updated and available real time, eliminating issues of data integrity that arise from maintaining multiple, overlapping databases. Integration issues among the IFMP modules are minimized with an ERP solution such as SAP. Exhibit 67 shows the scores and justifications for each risk factor for the viable alternatives.

Exhibit 67: Integration Complexity Risk Justification

Risk Factors	Alt	Score	Justification of Scores
Degree of Data Dependencies	SQ	1	This alternative is low risk because currently Personnel only links with Payroll and Employee Express.
	SAP	1	This alternative is low risk. Core HR will have data linkages with other IFM modules such as: <ul style="list-style-type: none"> • Position Classification - position descriptions, pay plan, series, • Resume Management - staffing actions, employee KSA updates • Payroll – leave without pay • Training budget - link to Core Financial (Budget and Procurement) All data linkages within SAP are already established as part of the backbone of the ERP system. However, external data links from legacy or other Federal Agency systems may potentially exist.
Interface Complexity	SQ	1	This alternative is low risk because currently Personnel only links with Payroll and Employee Express.
	SAP	1	This alternative is low risk. All data linkages within SAP are already established as part of the backbone of the ERP system. However, external data links from legacy or other Federal Agency systems may potentially exist.
Technical Compatibility	SQ	2	This alternative is average risk because the legacy system is currently integrated into the overall IFM architecture and can be integrated into future IFM architecture with a moderate amount of effort and programming. However, this is dependent upon the technical architecture of the other modules, particularly Core Finance.
	SAP	1	The SAP alternative is low risk because SAP has already been selected for the Core Financial project and is the product of choice for the other modules based on the IFMP “Best of Suite” strategy. The SAP product is an ERP solution with seamless integration between modules.
Average Score	SQ	1.3	Represents a low risk.
	SAP	1.0	Represents a low risk.

6.2 Market Risk

Market Risk includes the following risk factors:

- Operation in similar production environment
- Maturity of similar products in the industry
- Competitive environment

Operation in Similar Production Environment: Relates to the deployment of the system in a Federal environment, particularly in Federal Agencies with similar user bases, number of employees, and organizational structure (centralized business processes and technical environment versus decentralized).

Maturity of Similar Products in the Industry: Relates to the period of time that this system/tool has been in use in a similar production environment. Has the system/tool been fully tested and accepted – is it successful?

Competitive Environment: Refers to the number of vendors in the market/industry that support this alternative. Is the market operating as a monopoly or are there enough vendors to create some competition? Competition leads to market adjusted prices and continual value added services and upgrades. This factor also addresses market stability.

SAP is relatively new to the Federal marketplace. It is currently modifying its product to meet Federal requirements and was recently accepted to the list of JFMIP Qualified Core Financial Systems. However, SAP is currently working to modify the Core HR functionality of their SAP R/3 product to adhere to Federal guidelines. Although SAP has made a strong commitment to the Federal marketplace and has adequate resources to make the transition, there is risk that the Federal product enhancements will not be completed on time, may experience software bugs, and may not meet all Federal requirements, all of which would negatively impact the IFMP schedule. Further detail is provided in Exhibit 68.

Exhibit 68: Market Risk Justification

Risk Factors	Alt	Rating	Justification of Ratings
Existence in Similar Production Environment	SQ	2	This alternative is average risk because the legacy system is currently deployed in the NASA environment and is supported by a contractor, although, there is no guarantee for extended future support.
	SAP	2	This alternative is average risk because a number of Core HR COTS packages have been implemented at Federal Agencies (e.g., VA, Treasury, HHS, DOE). However, SAP's HR product is relatively new to the Federal market place and portions of the product are yet to be Federally certified. Thus, the risk for this alternative is slightly higher due to this consideration.
Maturity of Similar Products in the Industry	SQ	2	This alternative is average risk because while the legacy systems have operated adequately for ten years and have been upgraded numerous times to incorporate regulatory changes and new functional requirements, significant drawbacks and limitations have been identified in meeting Core HR needs.
	SAP	1	This alternative is low risk because a number of Core HR COTS packages have been implemented at Federal Agencies (e.g., VA, Treasury, HHS, DOE) and there are several HR COTS vendors in the marketplace.
Competition in Market Environment	SQ	2	This alternative is average risk because there is an abundance of contractor personnel with the knowledge base and experience in the market to support operations; however the system is not based on leading-edge technology. There is also an uncertainty in the availability of programmers outside the NASA community who may be familiar with the legacy system programming language.
	SAP	1	This alternative is low risk because there are a number of HR COTS vendors in the Federal marketplace including PeopleSoft, Oracle, and SAP.
Average Rating	SQ	2.0	Represents an average risk.
	SAP	1.3	Represents a low risk.

6.3 Technical Risk

Technical Risk includes the following risk factors:

- Flexible architecture
- Standards-based open technology (software/hardware)
- Alignment with industry direction (software/hardware)
- Availability of skills
- Support changes in requirements

Flexible Architecture: Refers to the ability to scale upward or downward in the support for system users and the entire customer community.

Standards-Based Open Technology: Refers to the industry definition of interface specifications for communication between software and hardware vendors. A standard is a definition or format that has been approved by a recognized standards-setting organization or is accepted across the industry as a common set of specifications. Standards make it possible to create a customized system by combining products from different manufacturers. Without standards, only hardware and software from the same manufacturers would be compatible.

Alignment with Industry Direction: Refers to the ability to provide interoperable software and hardware that is compatible with industry technology solutions. The ability of software and hardware on multiple machines from multiple vendors to communicate is enabled through protocol use. A protocol is an agreed-upon format for transmitting data between two devices (either hardware or software). As long as the two devices support the same protocol, interoperability can be achieved.

Availability of Skills: Refers to the ability to retain or make available the skill sets of personnel or vendors to maintain the knowledge bases (software and hardware).

Support Changes in Requirements: Refers to the ability of the alternative to meet Federal, Agency, and functional requirements. Is the system/tool flexible and adaptable to support changing conditions in business processes?

The technical risk for the SAP alternative is low. The alternative poses low risks because of the product's state-of-the-art technology, which is supported by multiple software environments and hardware platforms. State-of-the-art technology can be easily upgraded to match industry standards. Further detail is provided in Exhibit 69.

Exhibit 69: Technical Risk Justification

Risk Factors	Alt	Rating	Justification of Ratings
Flexible Architecture	SQ	2	This alternative is average risk because the legacy system has proven its scalability in terms of volume of users and data; however, it may not be as flexible as other, more leading-edge technology in terms of customization.
	SAP	1	This alternative is low risk because SAP is built on leading-edge technology that incorporates maximum ability to scale up or down in user and customer base.
Standards-Based Open Technology	SQ	2	This alternative is average risk because the legacy system currently resides on a mainframe environment (state-of-the-art IBM mainframe) that can be easily bridged with a central server environment if NASA decides to migrate towards a distributed computing environment. However, the software is based on ADABAS Natural programming language that is dated and will be difficult to support in the extended future.
	SAP	1	This alternative is low risk because SAP offers state-of-the-art technology that supports multiple software environments and hardware platforms.
Alignment with Industry Direction	SQ	2	This alternative is average risk because the legacy system currently resides on a mainframe environment (state-of-the-art IBM mainframe) that can be easily bridged with a central server environment if NASA decides to migrate towards a distributed computing environment. However, the software is based on ADABAS Natural programming language that is dated and will be difficult to support in the extended future.
	SAP	1	This alternative is low risk because SAP is based on leading-edge technology and can be easily upgraded to match industry standards for technology and best practices.
Availability of Skills	SQ	2	This alternative is average risk because although there are programmers currently available to support ADABAS Natural, programmers outside of NASA and the SESAAS contract will be unfamiliar with the NPPS coding. Therefore, it will be harder to find technical support in the future.
	SAP	1	This alternative is low risk because SAP is based on recent technology, and there is an abundance of skilled staff in the marketplace available to support leading-edge technology.
Support Changes in Requirements	SQ	2	This alternative is average risk because it supports the minimum HR requirements for processing personnel actions. However, it does not satisfy all the remaining functional Core HR needs and requires significant level of effort and time to incorporate regulatory changes. Furthermore, it does not easily accommodate future requirements.
	SAP	2	This alternative is medium risk. SAP, being new to the Federal HR marketplace, is currently going through the rigors of Federalizing its HR functionality. This consideration increases the risk of the alternative in supporting current and possible future requirements.
Average Rating	SQ	2.0	Represents an average risk.
	SAP	1.2	Represents a low risk.

6.4 Implementation Risk

Technical Risk includes the following risk factors:

- Implementation support (personnel)
- Project time frame (schedule)
- Project transition
- Process change management

Implementation Support (Personnel): This factor refers to the ability of NASA to supply the necessary resources (FTEs) to fully support the implementation of the system tools. This includes FTEs to staff the activities identified in the work breakdown structure. Answers the question—Can NASA supply the necessary FTEs (identified in the cost section) to fully support the alternative?

Project Time Frame: This factor refers to the ability of NASA to complete the implementation of the alternative within the established time frame. What factors would prevent NASA from adhering to this schedule and what is the probability that these factors will occur?

Project Transition: This factor refers to the ability to transition operations from a current system to a new or enhanced system. This includes the migration of data; concurrent or parallel operations of the existing and new systems; and the change in business process cultures (i.e., user acceptance).

Process Change Management: This factor refers to the number of people affected and the degree of change. This factor addresses the ability to incorporate business process improvements, develop the concept of operations, and facilitate user testing and acceptance for both systems/tools and processes. This factor also deals with the ability to train all users, including power users, intermittent, and end users effectively and within a reasonable time frame.

The implementation risk for the Status Quo alternative is low because there is no implementation associated with maintaining current operations. The SAP alternative poses an average implementation risk score. ERP projects are susceptible to schedule overruns due to sensitivity in meeting critical milestones, the relationship with the contractor, and the degree of coordination that is necessary. Additionally, statistical data from previous implementations indicate that ERP projects are vulnerable to cost and schedule overruns. The user community may also be resistant to change, notwithstanding the current condition of the legacy systems. Current business processes will be reengineered to adhere with industry best practices. Adequate training and communication for this alternative will be essential. Further detail is provided in Exhibit 70.

Exhibit 70: Implementation Risk Justification

Risk Factors	Alt	Score	Justification of Scores
Implementation Support	SQ	1	Not applicable
	SAP	2	This alternative is medium risk. NASA will need to assign Core HR functional experts to the implementation effort, but this raises the question of who will backfill the workflow left by occupied NASA implementers. This risk is partially mitigated, though, since the IFMP project is high profile and has high-level support within NASA. This high-level support will facilitate the allocation of resources necessary to adequately staff the module project.
Project Time Frame	SQ	1	Not applicable
	SAP	2.5	This alternative is medium/high risk because the project is susceptible to schedule over-runs due to sensitivity in meeting critical milestones, the relationship with the contractor, and the degree of coordination that is necessary. Additionally, statistical benchmarks suggest that ERP implementations are vulnerable to cost and schedule overruns. Selection of an implementation contractor with substantial SAP experience will help mitigate this risk. Additionally, SAP's Core HR functionality is still being modified for the Federal marketplace. A delay in the federalization process may impact the overall implementation of the Core HR module, not in project duration, but in the budgeted time frame of the module.
Project Transition	SQ	1	Not applicable
	SAP	1	This alternative is low risk. Although the project requires efforts to transition over 20 years of historical data (16.5 GB of data contained in the NPPS database), the data is maintained in a single database and current day software implementations almost always include some form of data conversion process. The risk of user acceptance must also be considered. However, data calls and interviews with NASA HR personnel indicate low user satisfaction with the current antiquated legacy systems. Therefore, it is anticipated that the new state-of-the-art system will be met with little resistance. Additionally, the learning curve for the new system will be mitigated through extensive hands on training. Assumption: This analysis includes the conversion of historical data contained in the current production environment; the Centers will be responsible for any additional data conversions.
Process Change Management	SQ	1	Not applicable
	SAP	3	This alternative is high risk because the project requires significant business process reengineering to incorporate streamlining and industry best practices. Any degree of change management is challenging because it requires users to change conditioned work habits, which is sometimes met by resistance in the early stages of a project. Extensive training and communication will be required to alleviate this. Past implementation failures often point to the absence of a comprehensive and thorough change management process or plan. This risk can be mitigated through, among other things, a phased training approach, PR communication throughout the process, a phased implementation for end users (e.g., HR professionals and then managers), and a Pilot site.
Average Scores	SQ	1.0	Represents a low risk.
	SAP	2.1	Represents an average risk.

6.5 Risk Comparison

The Status Quo alternative received the lower risk score. However, the score was largely attributable to the low implementation risk, which is weighted at 35%. Additionally, the integration complexity of the Status Quo is low risk because there are limited data linkages in the

current environment. The market and technical risks are average for the Status Quo. SAP received an average rating for its implementation risk, but the alternative still received a low overall risk score due to its low integration complexity, market, and technical risk. A summary of the risks for each of the alternatives is included in Exhibit 71.

Exhibit 71: Risk Score Summary

Risk Category	Weight	Status Quo	SAP
Integration Complexity	40%	1.3	1.0
Market Risk	15%	2.0	1.3
Technical Risk	10%	2.0	1.2
Implementation/Project Risk	35%	1.0	2.1
Weighted Average	100%	1.37	1.45
	Rating	Green	Green

Each alternative's numerical score was converted to a red, yellow or green rating based on the following scale:

Score	Risk	Color
1.0 – 1.6	Low Risk	Green
1.7 – 2.3	Average Risk	Yellow
2.4 – 3.0	High Risk	Red

6.6 Cost Risk

Several key assumptions have been identified that drive the cost estimate for the SAP alternative. These cost drivers are presented in Exhibit 72.

Exhibit 72: Cost Drivers

Cost Driver	Impact on Cost Estimates
Number of Users	The number of system users largely drives training costs. However, even though training costs are a major cost driver, these costs are mostly for government participants' time and are an internal cost that will not affect the project's (or NASA's) budget.
Level of Effort Estimates	The cost estimate is largely based on level of effort estimates to design and implement the new system. Although these estimates were developed using SAP subject matter experts and were based on analogous SAP implementations, poor estimates could misrepresent actual costs.
Contractor Wage Rate	The contractor wage rate is assumed to be \$1,400 per day, however, the actual wage rate will depend on the implementation contractor selected and the staff mix of the implementation team.
Civil Servant/Contractor Split	The civil servant/contractor split is assumed to be 15/85 during the Pilot and 55/45 during Rollout. If the actual split is more contractor heavy, costs will increase.
Length of Agency Design Phase	For the SAP alternative, the length of the design phase impacts the system development costs. The length of this phase depends on a variety of factors, including the amount of tailoring the SAP package would require, the amount of data conversion and cleanup needed, the number and complexity of the interfaces and workarounds, and the amount of business process reengineering/change management required.

7 DECISION ANALYSIS

This section presents the results of the cost, risk, and benefit analyses. This section brings all these factors together for each alternative so that an overall comparison can be made.

7.1 Financial Analysis

This Section provides quantitative estimates that are prepared using several standard financial analysis tools used for considering investments and capital planning. These financial indicators include total present value of costs and benefits, net present value, benefit cost ratio, and return on investment. The Net Present Value (NPV) of an alternative is an indication of the economic benefit NASA can expect to realize over the life of the project. In this BCA, NPV calculates future savings in terms of present value dollars and maps that to investment costs. The return on investment (ROI) is an indication of the "bang" NASA should get for every investment "buck." ROI is the ratio of savings achieved from an improvement effort to the total cost incurred to implement that effort. Various NPV, benefit cost ratio, and ROI calculations can be computed, depending on what is included in the definition of "savings." This BCA includes both system savings and mission savings (cost avoidance) when calculating the financial metrics.

To complete these calculations, the costs need to be grouped into two cost categories: 1) investment and 2) operations and sustaining support. Exhibit 73 shows the mapping of the SAP costs by WBS into investment costs or operations and sustaining support costs. These costs are presented in present value for the 10-year life cycle. The costs are also grouped by fund source.

Exhibit 73: SAP Financial Worksheet in Present Value (\$000's)
(Discount Rate 3.2%)

			WBS Number	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total	
Total	Investment Costs	Program Management (Program Costs)	1.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
		Integration Project (Program Costs)	1.2.1 + 1.2.2	\$ -	\$ -	973	\$ 79	\$ 77	\$ 74	\$ 72	\$ -	\$ -	\$ -	\$ -	\$ 1,275
		Module Project (Program Costs)	1.3	\$ -	\$ -	3,985	\$12,433	\$ 1,770	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$18,189
		Module Project (Enterprise Costs)	2.1.1 . . . 2.1.4	\$ -	\$ -	\$ -	5,946	\$15,049	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$20,995
		Total Investment Costs		\$ -	\$ -	4,958	\$18,458	\$16,896	\$ 74	\$ 72	\$ -	\$ -	\$ -	\$ -	\$40,458
	Operations and Sustaining Support	Integration Project (Program Costs)	1.2.3	\$ -	\$ -	330	\$ 1,304	\$ 1,263	\$ 1,224	\$ 1,186	\$ -	\$ -	\$ -	\$ -	\$ 5,307
		Module Project (Enterprise Costs)	2.1.5	\$ 3,125	\$ 3,044	\$ 2,976	\$ 1,562	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$15,362	
		Total O&S Costs		\$ 3,125	\$ 3,373	\$ 4,280	\$ 2,825	\$ 1,224	\$ 1,186	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$20,669	
		Total SAP Costs		\$ 3,125	\$ 8,331	\$22,738	\$19,721	\$ 1,299	\$ 1,258	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$61,127	
SAP	Fund Source 41	Investment Costs	Program Management (Program Costs)	1.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
			Integration Project (Program Costs)	1.2.1 + 1.2.2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
			Module Project (Program Costs)	1.3	\$ -	\$ -	66	\$ 1,825	\$ 248	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,139
			Module Project (Enterprise Costs)	2.1.1 . . . 2.1.4	\$ -	\$ -	\$ -	3,983	\$ 8,665	\$ -	\$ -	\$ -	\$ -	\$ -	\$12,647
			Total Investment Costs		\$ -	\$ -	66	\$ 5,807	\$ 8,913	\$ -	\$ -	\$ -	\$ -	\$ -	\$14,786
		Operations and Sustaining Support	Integration Project (Program Costs)	1.2.3	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Module Project (Enterprise Costs)		2.1.5	\$ 42	\$ 40	\$ 39	\$ 19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140	
	Total O&S Costs			\$ 42	\$ 40	\$ 39	\$ 19	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 140	
	Fund Source 42	Investment Costs	Program Management (Program Costs)	1.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
			Integration Project (Program Costs)	1.2.1 + 1.2.2	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
			Module Project (Program Costs)	1.3	\$ -	\$ -	29	\$ 158	\$ 148	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 335
			Module Project (Enterprise Costs)	2.1.1 . . . 2.1.4	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
			Total Investment Costs		\$ -	\$ 29	\$ 158	\$ 148	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 335
		Operations and Sustaining Support	Integration Project (Program Costs)	1.2.3	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Module Project (Enterprise Costs)		2.1.5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	Total O&S Costs			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	Fund Source 43	Investment Costs	Program Management (Program Costs)	1.1	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
			Integration Project (Program Costs)	1.2.1 + 1.2.2	\$ -	\$ -	973	\$ 79	\$ 77	\$ 74	\$ 72	\$ -	\$ -	\$ -	\$ 1,275
Module Project (Program Costs)			1.3	\$ -	\$ 3,890	\$10,451	\$ 1,375	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$15,715	
Module Project (Enterprise Costs)			2.1.1 . . . 2.1.4	\$ -	\$ -	\$ -	1,963	\$ 6,385	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 8,347	
Total Investment Costs				\$ -	\$ 4,862	\$12,493	\$ 7,836	\$ 74	\$ 72	\$ -	\$ -	\$ -	\$ -	\$25,338	
Operations and Sustaining Support		Integration Project (Program Costs)	1.2.3	\$ -	\$ 330	\$ 1,304	\$ 1,263	\$ 1,224	\$ 1,186	\$ -	\$ -	\$ -	\$ -	\$ 5,307	
	Module Project (Enterprise Costs)	2.1.5	\$ 3,084	\$ 3,004	\$ 2,937	\$ 1,543	\$ -	\$ -	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$15,222		
	Total O&S Costs		\$ 3,084	\$ 3,333	\$ 4,241	\$ 2,806	\$ 1,224	\$ 1,186	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$20,529		

Using the information in the worksheet displayed in Exhibit 73, the financial indicators can be calculated. The results of the financial analysis are presented in Exhibit 74.¹³

Exhibit 74: Total 10-Year Life Cycle Financial Summary in Present Value (\$000's)
(Discount Rate 3.2%)

	Status Quo	SAP
Total Present Value Costs	\$ 28,014	\$ 61,127
Total PV Investment Costs	\$ -	\$ 40,458
Total PV O&S Costs	\$ 28,014	\$ 20,669
Total Present Value Benefits	\$ -	\$ 45,342
Total PV System Savings	\$ -	\$ 7,345
Total PV Mission Savings	\$ -	\$ 37,997
Net Present Value	\$ -	\$ 4,884
Benefit Cost Ratio		1.12
Return on Investment		12%

¹³ ROI is defined for this BCA as the ratio of system and mission savings to total cost. If ROI were calculated using the ratio of system savings to total cost (void of mission savings) the ROI would be -82%.

7.2 Alternative Comparison

This Section identifies criteria NASA will use to decide on the best solution. Using cost, benefit and risk criteria, each viable alternative is analyzed. The following table provides a synopsis of the total costs and benefits in terms of present value. The qualitative factors are summarized by a color scheme and are also presented in Exhibit 75.

Exhibit 75: Decision Analysis Table in Present Value (\$000's)
(Discount Rate 3.2%)

	Status Quo		SAP	
<i>PV Cost - Investment</i>	\$	-	\$	40,458
<i>PV Cost - O & M</i>	\$	28,014	\$	20,669
Total PV Costs	\$	28,014	\$	61,127
<i>PV Benefits - System Savings</i>	\$	-	\$	7,345
<i>PV Benefits - Cost Avoidance</i>	\$	-	\$	37,997
Total PV Benefits	\$	-	\$	45,342
Qualitative Benefits	Red		Green	
Risk	Green		Green	

Green = Acceptable, Yellow = Marginal Acceptability, Red = Unacceptable

8 BUDGET INFORMATION

To assist with estimating necessary budgets for either the Status Quo or the SAP alternative, this section presents the estimated inflated costs over a 10-year period. The costs have been inflated using a 2.2 percent inflation factor, using FY01 as the base year. The reserve estimates for the Program costs are also included in this section. The SAP estimate includes a ten percent reserve amount for costs associated with Fund Source (FS) 43 for Formulation, Pilot and Rollout.

8.1 Status Quo

Exhibit 76 illustrates the costs associated with the Status Quo. These costs are only the contractor costs (FS 43) associated with the operations and sustaining support of the Status Quo. These costs do not include the costs for functional FTEs.

Exhibit 76: Status Quo Total Budget Costs for FS 43 (000's)
(Inflation Rate 2.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Current Year Costs with Reserves	\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013
Total Current Year Costs	\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013
Total Reserves	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.0 Program Implementation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.1 Program Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1 - 1.1.4 Program Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.1.5 Reserves	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2 Integration Project	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.1 Infrastructure Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.2 Module Implementation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.3 Operations and Sustaining Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.4 Reserves	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3 Core HR Module Project	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.1 Project Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.2 Project Formulation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.3 Agency Design	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.4 Pilot Center Implementation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.5 Pilot Center Training	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.6 Pilot Center Data Conversion	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.7 Rollout	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.8 Technical Refresh	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.3.9 Reserves	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.0 Enterprise Implementation	\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013
2.1 Core HR Module Project	\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013
2.1.1 Project Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.2 Other Center Rollout	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.3 Center Data Conversion	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.4 Center Training Delivery	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.1.5 Operations and Sustaining Support	\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013

Exhibit 77 shows the mapping of FS 43 costs from constant year to present value.

Exhibit 77: Crosswalk From Constant Year Costs to Present Value Costs for FS 43 (\$000's)

	Assumption	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Constant Year Costs	Base Year FY 2001	\$ 3,182	\$ 3,199	\$ 3,228	\$ 3,500	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 32,765
	Discount 3.2%	0.9690	0.9389	0.9098	0.8816	0.8543	0.8278	0.8021	0.7773	0.7532	0.7298	
Total Present Value Cost		\$ 3,084	\$ 3,004	\$ 2,937	\$ 3,086	\$ 2,798	\$ 2,712	\$ 2,628	\$ 2,546	\$ 2,467	\$ 2,391	\$ 27,652

Exhibit 78 shows the mapping of FS 43 costs from constant year costs to the budget costs.

Exhibit 78: Crosswalk From Constant Year Costs to Budget Costs for FS 43 (\$000's)

	Assumption	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Constant Year Costs	Base Year FY 2001	\$ 3,182	\$ 3,199	\$ 3,228	\$ 3,500	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 3,276	\$ 32,765
	Inflation 2.2%	1.0220	1.0445	1.0675	1.0909	1.1149	1.1395	1.1645	1.1902	1.2163	1.2431	
Total Current Year Cost		\$ 3,252	\$ 3,341	\$ 3,446	\$ 3,819	\$ 3,652	\$ 3,733	\$ 3,815	\$ 3,899	\$ 3,985	\$ 4,072	\$ 37,013

8.2 SAP

Exhibit 79 shows the total SAP budget cost for Fund Source 43. Civil servants (FS 41) and civil servant travel (FS 42) are omitted for budgeting purposes. These contractor costs do not include functional FTEs. The reserve value is also included in these estimates and shown in Exhibit 80.

Exhibit 79: SAP Total Budget Costs for FS 43 (000's)
(Inflation Rate 2.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Current Year Costs with Reserves	\$ 3,252	\$ 9,549	\$ 21,090	\$ 14,129	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 58,765
Total Current Year Costs	\$ 3,252	\$ 9,117	\$ 19,633	\$ 13,169	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 55,915
Total Reserves	\$ -	\$ 433	\$ 1,456	\$ 960	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,849
1.0 Program Implementation	\$ -	\$ 5,775	\$ 13,884	\$ 3,359	\$ 1,695	\$ 1,732	\$ -	\$ -	\$ -	\$ -	\$ 26,446
1.1 Program Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1 - 1.1.4 Program Management	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2 Integration Project	\$ -	\$ 1,449	\$ 1,623	\$ 1,658	\$ 1,695	\$ 1,732	\$ -	\$ -	\$ -	\$ -	\$ 8,156
1.2.1 Infrastructure Support	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.2.2 Module Implementation	\$ -	\$ 1,082	\$ 93	\$ 95	\$ 97	\$ 99	\$ -	\$ -	\$ -	\$ -	\$ 1,466
1.2.3 Operations and Sustaining Support	\$ -	\$ 367	\$ 1,530	\$ 1,563	\$ 1,598	\$ 1,633	\$ -	\$ -	\$ -	\$ -	\$ 6,690
1.3 Core HR Module Project	\$ -	\$ 4,327	\$ 12,262	\$ 1,701	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 18,289
1.3.1 Project Management	\$ -	\$ 372	\$ 1,519	\$ 776	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,667
1.3.2 Project Formulation	\$ -	\$ 2,089	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,089
1.3.3 Agency Design	\$ -	\$ 1,355	\$ 4,178	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,533
1.3.4 Pilot Center Implementation	\$ -	\$ -	\$ 3,873	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,873
1.3.5 Pilot Center Training	\$ -	\$ 511	\$ 1,859	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,370
1.3.6 Pilot Center Data Conversion	\$ -	\$ -	\$ 380	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 380
1.3.7 Rollout	\$ -	\$ -	\$ 452	\$ 925	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,377
1.3.8 Technical Refresh	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2.0 Enterprise Implementation	\$ 3,252	\$ 3,341	\$ 5,749	\$ 9,810	\$ -	\$ -	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 29,470
2.1 Core HR Module Project	\$ 3,252	\$ 3,341	\$ 5,749	\$ 9,810	\$ -	\$ -	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 29,470
2.1.1 Project Management	\$ -	\$ -	\$ 302	\$ 1,233	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,535
2.1.2 Other Center Rollout	\$ -	\$ -	\$ 566	\$ 3,725	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,290
2.1.3 Center Data Conversion	\$ -	\$ -	\$ 226	\$ 1,233	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,459
2.1.4 Center Training Delivery	\$ -	\$ -	\$ 1,210	\$ 1,710	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,919
2.1.5 Operations and Sustaining Support	\$ 3,252	\$ 3,341	\$ 3,446	\$ 1,909	\$ -	\$ -	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 19,266

Exhibit 80: Management Reserves for FS 43 (\$000's)
(Inflation Rate 2.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Pilot Reserves 1.3.1-1.3.6	\$ -	\$ 433	\$ 1,143	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,576
Rollout Reserves 1.3.1, 1.3.7, 2.1.1-2.1.4	\$ -	\$ -	\$ 314	\$ 960	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,274
Total Reserves	\$ -	\$ 433	\$ 1,456	\$ 960	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,849

Exhibit 81 shows the constant year FS 43 costs and how they map to the present value costs.

Exhibit 81: Crosswalk to Cost Analysis for FS 43 (\$000's)

	Assumption	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Constant Year Costs	Base Year FY 2001	\$ 3,182	\$ 8,728	\$ 18,392	\$ 12,071	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 51,494
	Discount 3.2%	0.9690	0.9389	0.9098	0.8816	0.8543	0.8278	0.8021	0.7773	0.7532	0.7298	
Total Present Value Cost		\$ 3,084	\$ 8,196	\$ 16,734	\$ 10,642	\$ 1,299	\$ 1,258	\$ 1,219	\$ 1,181	\$ 1,145	\$ 1,109	\$ 45,867

Exhibit 82 shows the crosswalk from constant year costs to budget costs for FS 43.

Exhibit 82: Crosswalk From Total Constant Year Costs to Total Budget Costs for FS 43 (\$000)

	Assumption	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Constant Year Costs	Base Year FY 2001	\$ 3,182	\$ 8,728	\$ 18,392	\$ 12,071	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 1,520	\$ 51,494
	Inflation 2.2%	1.0220	1.0445	1.0675	1.0909	1.1149	1.1395	1.1645	1.1902	1.2163	1.2431	
Total Current Year Cost		\$ 3,252	\$ 9,117	\$ 19,633	\$ 13,169	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 55,915

Exhibit 83 shows a summary of all the fund source costs. Fund Source 41 is the cost for civil servant FTEs and Fund Source 42 is made up of civil servant travel and other non-FTE related civil servant costs. Fund Source 43 is for contractor related services.

Exhibit 83: SAP Costs By Fund Source including Reserve Amounts (\$000's)
(Inflation Rate 2.2%)

	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	Total
Total Costs											
Fund Source 41	\$ 44	\$ 119	\$ 6,859	\$ 11,052	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 18,074
Fund Source 42	\$ -	\$ 32	\$ 185	\$ 183	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 400
Fund Source 43	\$ 3,252	\$ 9,117	\$ 19,633	\$ 13,169	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 55,915
Total Costs	\$ 3,296	\$ 9,268	\$ 26,678	\$ 24,404	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 74,389
Total Reserves	\$ -	\$ 433	\$ 1,456	\$ 960	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,849
Total Costs w/ Reserve	\$ 3,296	\$ 9,700	\$ 28,134	\$ 25,364	\$ 1,695	\$ 1,732	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 77,239
Program Implementation											
Fund Source 41	\$ -	\$ 74	\$ 2,141	\$ 307	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,521
Fund Source 42	\$ -	\$ 32	\$ 185	\$ 183	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 400
Fund Source 43	\$ -	\$ 5,775	\$ 13,884	\$ 3,359	\$ 1,695	\$ 1,732	\$ -	\$ -	\$ -	\$ -	\$ 26,446
Total Costs	\$ -	\$ 5,882	\$ 16,210	\$ 3,849	\$ 1,695	\$ 1,732	\$ -	\$ -	\$ -	\$ -	\$ 29,367
Enterprise Implementation											
Fund Source 41	\$ 44	\$ 45	\$ 4,718	\$ 10,745	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 15,552
Fund Source 42	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Fund Source 43	\$ 3,252	\$ 3,341	\$ 5,749	\$ 9,810	\$ -	\$ -	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 29,470
Total Costs	\$ 3,296	\$ 3,386	\$ 10,467	\$ 20,555	\$ -	\$ -	\$ 1,770	\$ 1,809	\$ 1,849	\$ 1,890	\$ 45,022

9 RECOMMENDATIONS

This section presents the recommended alternative based upon the results of the decision analysis.

9.1 Recommended Alternative

This business case analysis presented the cost, benefits, and risks associated with the Status Quo and the SAP alternative. Taking all of these factors into consideration, the SAP alternative represented the most cost-effective solution. Both the Status Quo and SAP alternative have relatively low risk, but the SAP alternative has high potential benefits versus the low benefits of the Status Quo. The added cost of the SAP alternative will not only allow Core HR personnel to meet the Core HR functional drivers and provide more value added services to the organization, but it will also fit in with NASA's ERP vision and is a more sustainable solution in the long run than the Status Quo.

9.2 Integration Points with Other Modules

Looking ahead to the actual implementation of the selected alternative, Core HR data that is provided to and received from other Modules will affect the design of the Core HR Module. Such data dependencies drive the number of interfaces required to support the Core HR functions through the transition period. (Upon full implementation of all Modules, the ERP solution will be completely integrated and only a few specialized interfaces will be needed.) As individual Modules are deployed, implementation of temporary interfaces is inevitable; however, the number of interfaces required can be minimized through strategic planning.

APPENDIX A

A.1 Human Resources Implementation Strategy

NASA explored both a “big bang” and phased implementation approach for the Human Resources modules (Core HR, Payroll, and Time and Attendance). The “big bang” approach would be a single phased implementation of a system supporting all the functionality for Core HR, Payroll, Labor Distribution, and Time and Attendance. However, a “big bang” approach was deemed non-viable due to a combination of the following factors:

- The current functionality of the SAP software and its ability to meet NASA’s Human Resources needs,
- The logical implementation sequencing of SAP functionality,
- The additional risk inherent in a “big bang” strategy,
- The state of NASA’s Human Resources legacy systems, and
- NASA budget constraints.

Since a “big bang” approach was concluded to be non-viable, NASA explored the different options for a phased implementation strategy. NASA’s most pressing HR need at this time is for a new, consolidated Core HR system. The current system failures are documented in the Case for Change section of this BCA. In 1996, NASA successfully transitioned from ten separate Center payrolls to establish the Consolidated Payroll Office (CPO). The enhancements from the consolidation and formation of the CPO allow NASA to adequately meet its current payroll needs. As a result, a payroll system upgrade or replacement, while necessary in the long run, is not an immediate high priority item for NASA. Given these conditions, it was deemed that a two-phased implementation with Core HR being implemented first, followed by a second phase for implementation of Payroll, Labor Distribution, and Time and Attendance, was the preferred approach. This approach will adequately balance Agency priorities with budget constraints and the maturity of commercial software products in the Federal arena.

Exhibit 84 shows the Human Resources operating environment following the completion of Phase I.

Exhibit 84: Future Operating Environment – Phase I

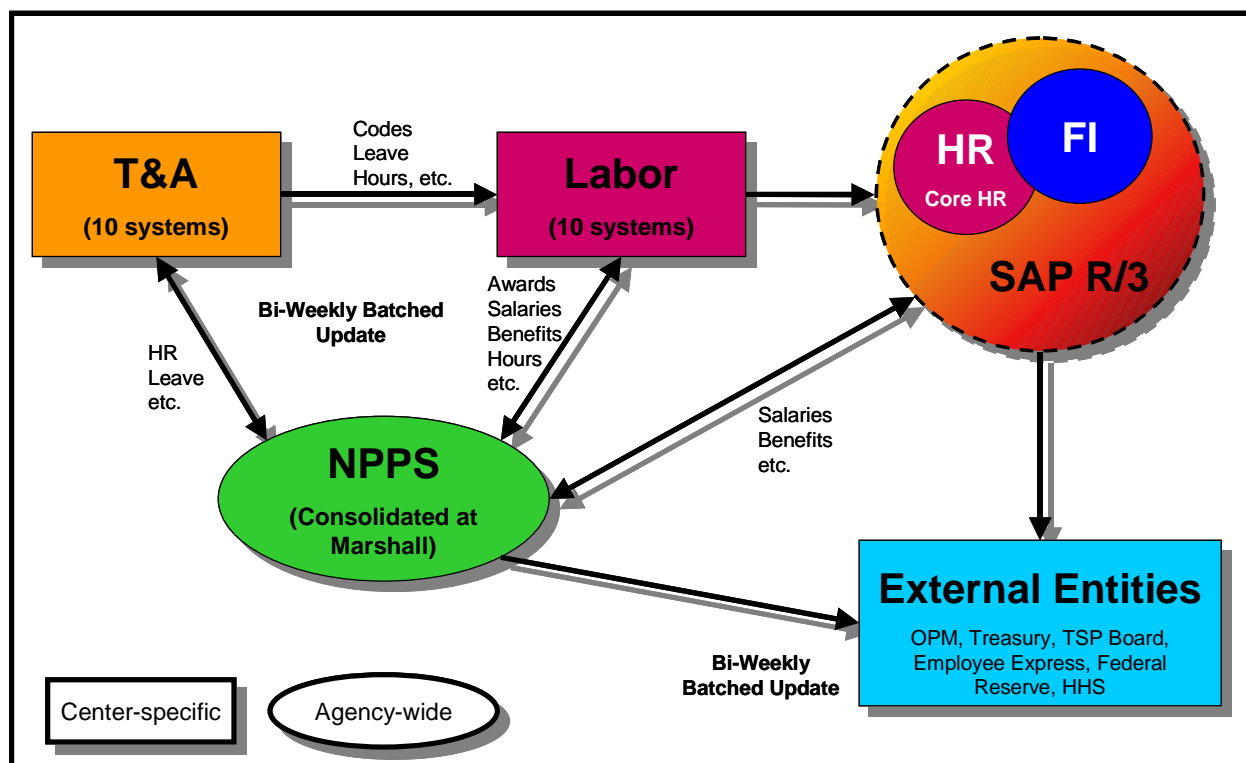
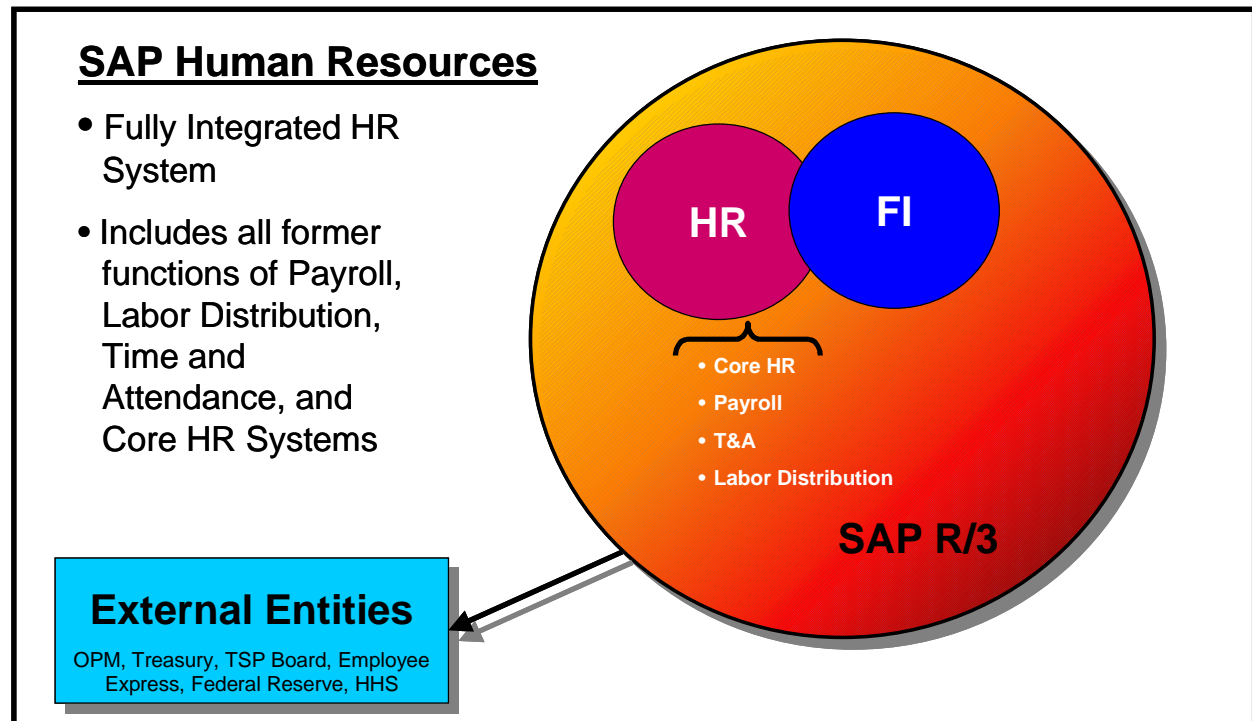


Exhibit 85 shows the operating environment for Core HR, Payroll, Labor Distribution, and Time and Attendance at the completion of Phase II.

Exhibit 85: Future Operating Environment – Phase II



The benefits realized at the completion of Phase I will be directly related to Core HR specific functions such as the ability to track employee competencies and strategic workforce planning. Phase I will not fully support the business and functional drivers relating to full cost accounting in the absence of the Payroll, Labor Distribution, and Time and Attendance capabilities. However, it will be a necessary first step to meeting NASA's full cost accounting goals. The full scope of benefits of the ERP system will only be realized once all of NASA's HR modules are implemented. The benefits realized after the full implementation (Phase II) will reach far beyond the satisfaction of NASA's business and functional drivers and compliance with Federal regulations and guidelines; it will provide NASA with value added propositions that create a new paradigm in which NASA conducts its business.